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EDITORIAL NOTICES.

PRIMARY CLOSURE IN PROSTATECTOMY.

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The advisability of completely closing the bladder following prostatectomy has been advocated during recent years, and for the procedure many benefits and improved results are claimed. This may be so, but for the enlightenment of those not conversant with the technique it seems desirable that the disadvantages as well as the benefits should be indicated.

For the last five years I have continuously used primary closure in prostatectomy both in public hospital service and in my private practice, employing slightly varying methods, but always with the object of primary closure whenever possible. Under favourable conditions the results have been highly satisfactory, but at other times have been such that my desire to continue with surgery, and urology in particular, has almost ceased. However, all urological surgeons dealing extensively with prostatectomies must be subject to this feeling occasionally.

In primary closure, when uneventful, the results are so pleasing that it is almost impossible not to apply the procedure universally, but it is very doubtful if it will ever be done successfully except under ideal conditions.

For the years during which I have employed primary closure, my results in private practice have been good, but in public hospital they have not been altogether satisfactory. The explanation of this variance in results is that my private patients are confined to hospitals where urological work is done extensively, where staff nurses are trained in their work and can afford to give individual attention to each patient. Also the patients themselves are in better condition physically, whereas in public hospital some of the patients are admitted almost *in extremis,* while frequently others are in very poor physical condition, so that the surgical risk is not all that could be desired. In addition to this the staff is continually changing, and for economical reasons each nurse has to attend to numerous patients. It is very difficult under these conditions to expect or obtain the continuous and meticulous after-treatment in public hospital that is so all important in this work. There is no doubt, also, that in a long convalescence during which infective processes

have to be kept in check, a well-balanced diet well supplied with the necessary vitamins is essential.

If ever a surgeon was at the mercy of the nursing staff, it is the urologist following prostatectomy with primary closure. This, in my opinion, constitutes one of the chief disadvantages of the operation. All your pre-operative preparation by which the patient may have been brought to the highest pitch of condition, and your most skilful and satisfactory operative technique, may be completely undone within a few hours after operation by some slight neglect or defect in the post-operative attention. This responsibility thrown on the nursing staff seems more than should be expected, excepting in individual highly trained cases. If it is possible for a couple of expert nurses, trained in this work, to have complete and continuous charge of a patient, there seems little to fear in the post-operative convalescence, but it is essential that they should stand guard over the patient and not permit anyone else to handle him. This state of affairs unfortunately is not always possible, and when it is not obtainable the surgeon is surely looking for trouble if he tries primary closure and leaves the after-treatment to an inexperienced or casual nursing staff. Thus the first and most essential requirement is an absolutely trustworthy nursing staff who appreciate the meaning of asepsis, and who are willing to give continuous and faithful attention to the strictly aseptic after-treatment of the patient.

The satisfactory development of some technique by which all bladders could be completely closed with safety after prostatectomy would be a most gratifying achievement from every point of view. From the surgeon's standpoint it would bring the operation into line with a comparatively simple abdominal operation and he would have the satisfaction of seeing his patient removed from the operating table with all hæmorrhage stopped and with every prospect of an uninterrupted, rapid and comfortable convalescence. Under favourable conditions the patient is dry and comfortable from the moment he gets back to bed; he is not disturbed by having the dressings continually changed nor by the sight of them being horribly blood stained, giving the impression that his bleeding appears uncontrolled and may remain so. There is quite an element of anxiety removed in this way in many cases, but by far the most desirable feature from the patient's point of view is that he is always dry, instead of being constantly more or less wet, and having to be disturbed for that reason. The fact that dressings and bedclothes do not have to be changed more often than for the normal straightforward operation is of advantage in every respect. It means less work for the nursing staff, less disturbance of the patients, and less drain on the hospital's supply of linen and bedding.

Primary closure in prostatectomy has been employed by various men for many years, Lower of America apparently being the first man to attempt the procedure, and Harris and Gordon Craig having done most of the pioneer work in this country. Up till quite recently, in all cases

in which primary closure was used, the prostatectomy was performed by the suprapubic route. Gibson has recently described primary closure following prostatectomy by the perineal route. This opens up the old controversy of the merits of suprapubic *versus* perineal prostatectomy, which constitutes a very much debated subject.

There seems little doubt that in the hands of experts the mortality by the perineal route is less than by the suprapubic as done by the open method. By the former method the patients are up quicker, the drainage is better and infection in the perineum seems to be better handled than in the suprapubic region. On the other hand, the suprapubic route is much better for men not accustomed to perineal work, as the operation is much easier and much less damage is likely to be done. To men not accustomed to perineal prostatectomy there is a great danger of damaging the rectum, leading to the formation of rectal fistulæ and also to the destruction of the vesical sphincters resulting in urinary incontinence. When primary closure is being considered it would appear that the suprapubic approach has much to commend it and is more suitable to this technique than the perineal.

In preparing for a suprapubic removal of the prostate there are certain precautions which are advisable. The first of these is the washing out of the bladder and urethra with one in 5,000 oxycyanide solution prior to operation. Following this, the patient must be put on the operating table with his bladder empty. Since infection in the prevesical space is highly undesirable, it is necessary to take every precaution against unduly soiling the cellular tissue there. This is best safeguarded by operating on an empty bladder which has previously been well irrigated as above mentioned, and by avoiding any unnecessary exploration of the prevesical space and not breaking down any more of the cellular planes than is required for an adequate incision of the bladder wall.

Once the bladder is opened and self-retaining retractors are set in position, we can proceed with the actual removal of the prostate. The first step which we have employed is definitely to incise the mucosa near the apex of the middle lobe. Following this mucosal incision it is reflected off the middle lobe by blunt dissection. Enucleation of the prostate is then carried out. No exact rules can be laid down for this, as the method used will depend on the type of hypertrophy. The one essential is to insure getting into the right plane of cleavage, for enucleation is certainly extremely difficult and a very unsatisfactory procedure if attempted otherwise. If a prostate cannot be enucleated readily, there is strong reason to suspect that you are not in the right line of cleavage or else that malignant changes have occurred in the gland. Following removal of the prostate, the next step is to check hæmorrhage as far as possible. At times hæmorrhage may be very profuse, and if not controlled early renders the subsequent steps in the operation much more difficult. The best method for the initial checking of hæmorrhage is undoubtedly by pressure on the prostatic bed by means of large gauze packs. If firm pressure is applied for a couple of minutes

it definitely stops a lot of the bleeding. It is then possible to get a view of the bladder neck, which should be trimmed up, and any ragged ends or tags should be removed. The persistent bleeding can now generally be controlled by plain catgut sutures placed laterally on either side of the neck. These sutures must be placed on either side of the trigone, care being taken to avoid the ureteral orifices; the sutures must include the muscle tissue as well as the mucosa. If they are correctly placed, there is seldom much bleeding after they are tied. It is very important in applying these sutures that you do not establish a ridge at the bladder neck by pulling up the trigone. If this happens, post-operative complications are likely to develop; these will be discussed later. The active bleeding should be now definitely under control, and it should be possible to get a view into the prostatic bed. An endeavour should next be made to pick up the end of the membranous urethra in order that the mucosal flap which was dissected off the middle lobe may be sutured to it. If it is not possible to do this, the capsule of the prostate should be picked up as far forward on the prostatic bed as possible. A plain catgut suture is passed through this by means of a small round needle, and the mucosal flap connected to the trigone can then be pulled over the prostatic bed, a straight approach from the urethra into the bladder being thereby produced. This pulling of the mucosal flap from the bladder over the floor of the prostatic cavity is done with the object of preventing any subsequent subtrigonal tunnelling, which is a very important condition where suturing of the bladder neck is done. It is well to remember, when placing sutures in the floor of the prostatic cavity, that the rectum is adjacent and must not be included in a too extensive suture. An indwelling urethral catheter is now introduced; the catheter overlies the flap which has been pulled into the prostatic cavity and helps to keep it in place. Plain gut sutures can now be placed anteriorly and the bladder neck reformed to something like its original size. It is essential that plenty of drainage is left from the prostatic cavity into the bladder, and bleeding must not be controlled by suturing the bladder neck tightly round the catheter. This is a very easy method of immediately stopping hæmorrhage, but it often leads to conditions that are more worrying and more difficult to handle than the bleeding at the time of operation. The bladder neck having been reformed, a fishing-gut suture is passed through the tip of the urethral catheter and the two ends are left long enough to be brought out through the abdominal wound and fixed to a small piece of rubber tubing outside. This fishing gut serves two purposes; in the first place it anchors the urethral catheter in position, and, secondly, it acts as a capillary drain in case of any leakage. The bladder can now be closed tightly, the fishing-gut sutures being brought out through the top of the incision. If desired, the space of Retzius can be almost obliterated by suturing the closed bladder up to the neck of the rectus muscles. After the skin is sutured, the ends of the fishing gut which determine the position of the urethral catheter are tied to a small piece of rubber tubing. By means of traction on these the position of the urethral catheter can be altered in case of any blockage. As a final step before the patient leaves the table it is

advisable to irrigate the catheter and make sure that it is running freely and clear of any clots. This often saves a lot of trouble, as blood generally gets into the catheter during its introduction and may clot before the operation is completed. If the bladder is well irrigated before the patient leaves the table and one is sure that the catheter is quite clear, it may save a lot of unnecessary irrigation and disturbance when the patient is returned to the ward.

In many ways, primary closure of the bladder following prostatectomy has much to recommend it, but at the same time there is much to be said against this step. Under favourable conditions, with the bleeding completely controlled at the time of operation and continuing so during convalescence, and with a well-trained nursing staff in attendance, the post-operative course may be that of a simple appendicectomy. The patient under these conditions will remain dry and comfortable, he will be up and passing his urine naturally in two weeks and home again within three weeks of his operation. This represents the ideal, and, as stated, can generally be accomplished, but not always. There is another side to the picture which I should like to emphasize to those not accustomed to this procedure and who contemplate adopting it. The troubles encountered in primary bladder closure can be divided into the immediate and the delayed. The immediate are met firstly during operation when the carrying out of the steps so easily described may be found extremely difficult in execution. Successful and complete control of the bleeding without suturing the bladder neck tightly round the catheter is not so readily obtained as it might seem. The obliteration of the trigonal ridge which is essential at times, calls for a considerable degree of technical skill, and unless this is done correctly it is going to give rise to trouble. Next comes the question of obliterating the prevesical space. If the abdominal wound is closed without drainage, it is very easy for leakage to occur from the bladder into this space and not be recognized. If this happens, there is a toxic absorption set up which may play havoc with the patient's general condition. There is no doubt that absorption from the prevesical space can be both rapid and severe, and if leakage does occur here, free drainage is essential. Let us assume that a patient has been operated on satisfactorily and returned to his bed, when it is found that the catheter is not draining and therefore requires irrigating: it is now the trouble begins, for that catheter must run freely, as everything depends on it. If it blocks, then extravasation results, the bladder becomes distended and blood-stained urine is forced under pressure into the prevesical space, where it readily extends in the cellular planes. Absorption and infection probably follow, which are serious things for the patient. The catheter sometimes persistently becomes blocked for a time, chiefly due to the immediate post-operative oozing and the diminished rate of urinary secretion following operation, and if the irrigation is not done under the most rigorously aseptic precautions, it is very easy to introduce infection by this means. The patient further has to be watched constantly during the first twenty-four hours to insure that the catheter

does not remain blocked long enough for the bladder to overfill and lead to extravasation. This applies in a lesser degree during the whole convalescence. The necessity for active and intelligent cooperation of the nursing staff can thus be readily appreciated.

The delayed complications are chiefly those of the open method, but there is an additional tendency to stricture formation unless the bladder neck is reformed correctly. Pyelonephritis is very prone to be produced if catheter blocking occurs, and intravesical tension is set up. It seems that the intravesical tension becomes great enough actually to force infection into the venous circulation of the prostatic cavity and results in the rapid development of pyelonephritis. Whether it is directly by this route that the pyelonephritis originates cannot be determined for certain, but one thing is definite, and that is if blocking and extravasation do occur, pyelonephritis is very prone to develop. An illuminating evidence of this type was observed some years ago.

Two patients were operated on within a week of one another and in each case bleeding was active and was controlled by suturing the bladder neck tightly round the catheter. In both cases the catheters drained freely, but bleeding occurred so actively in the prostatic cavity that blood was forced out of the urethra alongside the catheter. In both these cases there was a rapid onset of acute and fatal pyelonephritis in spite of the fact that the bladder was draining freely.

This would appear clearly to indicate a hæmatogenous infection of the kidneys due to the tension set up in the undrained prostatic cavity. Since that time the prostatic cavity has not been closed tightly round the urethral catheter, free drainage into the bladder being always assured. Since this precaution has been taken there has not been any death from pyelonephritis in my private practice.

Pulmonary embolism constitutes the greatest trouble at the present time, and seems to occur at intervals in spite of all the measures taken to combat it. Whether in these old men the blood pressure falls sufficiently during operation to permit some clots to form which later become dislodged resulting in pulmonary embolism, whether it is just the patients' age, or whether there is some special feature in prostatectomy predisposing to it, is difficult to say, but I never feel perfectly happy about any patient until he has been actually walking round for a few days. In attempting to overcome it, the patients are encouraged to move their legs or to have them exercised from the first post-operative day. This is now done as a routine, the patients also being moved and having their positions changed regularly in bed. Whether these precautions really help it is difficult to say, but at least an endeavour is being made to overcome one of the most unexpected and disappointing setbacks which could possibly be visited on anybody.

Secondary hæmorrhage is very seldom met if the bleeding has been efficiently and correctly controlled at operation. Once again the importance of arresting the bleeding without suturing tightly round the urethral catheter must be emphasized. The only serious secondary

hæmorrhages which have been encountered developed after the bleeding
had been controlled by suturing the bladder neck tightly round the
catheter. This might possibly have been coincidence, but I hardly
think so. Whether or not, I am firmly convinced that the prostatic cavity
must have free drainage and this cannot be obtained satisfactorily if
the bleeding is controlled in the manner discussed.

The suturing and reformation of the bladder neck at operation
would not appear to present any difficulties when one reads about it,
and anyone not accustomed to performing it might be inclined to regard
this as a comparatively simple matter. Under favourable conditions
it can be, but it is certainly not always so, and unless it is performed
properly, the late results may be most unsatisfactory. There is no
difficulty in placing sutures at random round the bladder neck which
will, if introduced in sufficient numbers, check the hæmorrhage, especially
if they result in closing the bladder neck tightly round the catheter.
This procedure certainly gives the ureters a chance of being included in
the sutures as they are often very close to the newly formed neck. It is
essential that the site of the ureteral orifices be known before any lateral
sutures are placed, and once again it would appear a very simple thing
to keep them always under view, but it is not always so simple as it
sounds to the inexperienced.

The reformation of the bladder neck must be very carefully and
deliberately done if a permanently satisfactory result is to be obtained.
As already stated, there is not much difficulty in blindly and aimlessly
suturing the bladder neck tightly round the urethral catheter, and it will
generally stop the bleeding. This gives the surgeon a feeling of satisfaction
as he swabs out the bladder and happily demonstrates the hæmostasis
produced. His happy frame of mind, however, may not last indefinitely,
and in addition he may be confronted with another delayed complica-
tion which can be extremely troublesome. It must be remembered that
when a large prostatic adenoma is removed, a very considerable gap
is left as a result in the prostatic cavity and urethra. If the bladder
neck is reformed without regard to this fact, an hour-glass effect is pro-
duced between the bladder and the prostatic cavity, and as the healing
and filling up of this space is slow, it is easy to see how the bladder
neck, which has been pulled together by suturing, can, as it further
contracts, become eccentrically placed. Precautions against this happen-
ing are necessary at the time of operation. If this is not done, the
opening of the bladder into the urethra will somewhat resemble the open-
ing of the cervix into the vagina, and considerable difficulty may be
experienced in introducing sounds, which may make subsequent dilata-
tion impossible. The best means of preventing this are by: (i) not
suturing the bladder neck too tightly; (ii) obliteration of the prostatic
cavity as much as possible, and (iii) by the prevention of any trigonal
ridge being formed. If no reformation of the bladder neck is attempted,
as by the old open method, these complications are greatly lessened.
Under the old conditions the bladder neck was left gaping and when

healing occurred it closed in at about the same rate as the prostatic cavity. When this happened no undermining was produced, and in consequence no difficulty was experienced in post-operative dilatation. When suturing of the bladder neck is being done, the reformation of the prostatic urethra must be kept in mind all the time. Rather than produce an hour-glass effect by closing the neck tightly without oblitera-tion of the prostatic cavity, a much better result would be obtained by trying to obliterate the cavity and leaving the neck open.

Having taken some definite steps to insure the correct reformation of the urethral floor, either by suturing a flap of the mucosa down on to it or eliminating any trigonal ridge according to the particular case, one next proceeds with the obliteration as much as practicable of the prostatic cavity. This is best done by deeply placed plain catgut sutures; these must be deeply placed and not just include the vesical mucous membrane, and can be placed both laterally and anteriorly. As a final precaution against stricture formation it is always advisable to use dilatation in all these patients before they leave hospital, and again within a month after their leaving.

If the points emphasized are observed and applied to suitable cases, there is no reason why primary closure should not be performed, and, when done satisfactorily, the results should be excellent. At all times, however, it would seem that the first essential to successful prostatectomy is good and free drainage and everything should be sacrificed to this end. If there is any doubt about the efficiency of the drainage or the bleeding not being sufficiently controlled, the suprapubic tube will gener-ally overcome the trouble. It does not have to be a large tube or left in for long, and it need not make any difference to the convalescence. Of course, if a suprapubic tube is introduced for only twelve hours, one cannot claim to have performed primary closure, but, after all, the patient's life is the first consideration.

SUMMARY.

The objects of this article are to set forth the observations made during the last five years with primary closure in prostatectomy. This technique has been much advocated recently, and to those who have not had much experience with it, it would certainly appear ideal. Like many other surgical procedures, however, it is at times easier to describe than to perform. The disparity between the results obtained in public and in private hospital practice is undoubtedly due in part to the average better condition of the private patients and the better balanced diet which they receive. The adequate supply of vitamins is very necessary to aid in combating infective processes, as the patient's resistance is undoubtedly materially raised by this means. Further, it is not possible for the patients to receive the individual attention in public hospitals that is possible in private. In any case, there is a marked difference in the results obtained, although that applies to any form of prostatectomy.

The mortality rate obtained by the inexperienced with primary closure is likely to be greater than by the open method, but as one

becomes accustomed to the requirements of the technique, the mortality should be equally as low as by the open method, and in expert hands possibly better. Under favourable conditions, and when the operation is properly performed, the results obtained by primary closure surpass anything I have ever seen produced by any other technique. In fact, when employed in suitable cases it can almost be brought into line with a simple uncomplicated appendicectomy. Having obtained such ideal results in some cases, one is inclined to expect them in every case, but it is not always possible and in endeavouring to secure them the operator may take steps which are not surgically sound and consequently trouble may result.

Following removal of the prostate the two essential operative steps are: (i) arrest of the hæmorrhage, and (ii) free drainage, and on the effectiveness of these two will largely depend the result of the operation, no matter by what route or technique it may be performed.

As these two conditions are somewhat interdependent, the importance of complete hæmostasis becomes obvious, and this is sometimes difficult without suturing the bladder neck tightly round the indwelling catheter, which in my opinion is not a wise procedure for the reasons already outlined. In such cases the patient is going to require a lot of immediate post-operative manipulation and attention in order to keep the drainage clear, and this all increases the likelihood of infection being introduced. If the catheter is permitted to become blocked, extravasation will occur which frequently leads to serious trouble. When the bleeding cannot be controlled as well as desired, and when there is a possibility of considerable and continuous post-operative manipulation, the introduction of a small suprapubic tube will generally overcome the difficulty. This requires to be left only for a very short time and does not seem to make any serious difference to the period of convalescence. The establishment of a means of through and through irrigation and of freer drainage makes a considerable difference to the patient and lessens the amount of post-operative manipulation. The post-operative care of the patient calls for most painstaking and skilled nursing which may at times prove very exacting, and any slackness in this respect may undo the good obtained by the most perfect operative technique. One of my chief objections to primary closure is the manner in which the surgeon is at the mercy of his nursing staff. Neglect on their part can lead to more serious trouble in primary closure than by the open method, and this is one of the reasons why the technique is not likely to become extensively adopted.

From my experience I would unhesitatingly say that in the hands of men accustomed to the technique of primary closure and working in conjunction with a painstaking and experienced nursing staff, the results obtained are at times ideal, but I would not recommend it in all cases nor to all men. It is essentially an operation for a specialist and demands such a combination of operative technique and post-operative care that its universal adoption seems improbable.

EPITHELIUM-LINED BLOOD CYSTS OF THE OVARY.

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THE epithelium-lined blood cysts of the ovary are amongst the most intriguing structures encountered in the organ, since not only is their effect on the patient disabling both with regard to general and generative function, not only are their complications serious, but they present an extraordinary diversity of appearances, and the study of their nature affords examples of some most interesting pathological problems. Though they are found not uncommonly, their origin is enshrouded in mystery.

Two main varieties have been described: (i) The tarry luteal cysts which have developed a heterotopic epithelial lining. These are usually single, occasionally double, often bilateral, and in diameter vary from 1·25 centimetres (half an inch) to several centimetres (see Figure VII). (ii) The multiple small tarry or chocolate cysts which have been described as endometrial" (see Figure I). The tarry luteal cysts have been thoroughly considered by Brakeman and Shaw, amongst others, in some most illuminating papers. It is the second group which it is proposed to discuss more particularly here.

HISTORICAL.

In 1898 Fraenkel[3] described six examples of luteal cysts and made his valuable classification of such cysts into: (i) those lined by luteal cells, (ii) those lined by connective tissue internal to the luteal cells and (iii) those in which a heterotopic epithelial lining rests on the inner aspect of the connective tissue.

In 1889 Russell[9] described an epithelium-lined blood cyst of the ovary and since the epithelium closely resembled endometrium, he concluded that this cyst came from a remnant of the Müllerian duct. His excellent illustrations make it clear that he was dealing in reality with a collapsed tarry luteal cyst with a complex epithelial lining. The peculiar morphological characteristics of the epithelium loomed so large that the general nature of the cyst was not appreciated. In the majority

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FIGURE I. Coloured drawing of two ovaries which contain multiple small chocolate or tarry cysts. The organs contain many cysts, both superficial and deep. The larger ovary (from the left side) contains a large deeply situated cyst in addition.

FIGURE II. Drawing of a section of an ovary containing multiple blood cysts. BL = A hyalinizing *corpus luteum* blood cyst which possesses a columnar epithelial lining. The site of the rupture of the Graafian follicle from which the *corpus luteum* arose is to be seen at X. The development of glands in relationship to this cyst is shown. BA = A hyalinizing blood follicular cyst lined by columnar epithelium. A = Atretic follicle. A_2 = Atretic follicle into which hæmorrhage has occurred.

FIGURE III. Camera-lucida drawing of a section of an ovary containing multiple blood cysts which macroscopically were typical "endometriomata". Many atretic follicles are present, some collapsed. Blood cysts of luteal origin are to be seen. No epithelium lined glands are present in this section, though other parts of the ovary from which it was taken showed many examples. A = Atretic follicle. A_1 = Atretic follicle in which the *stratum granulosum* has disappeared. A_2 = Atretic follicle containing blood. L = *Corpus luteum* blood cyst. C.A. = *Corpus albicans* blood cyst. Iron hæmatoxylin and Van Gieson stain.
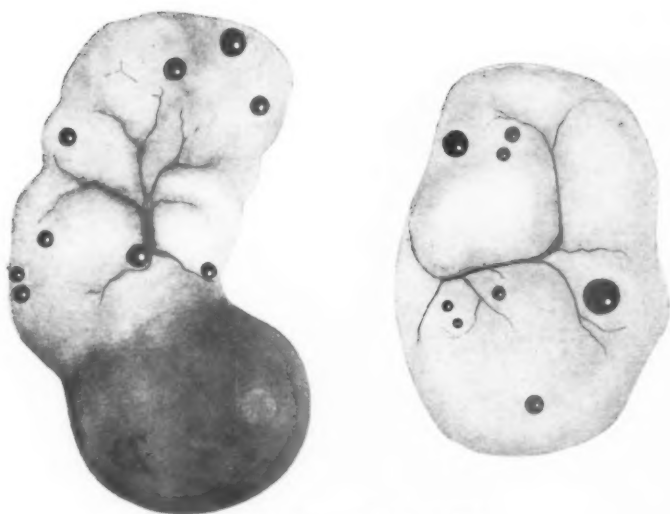
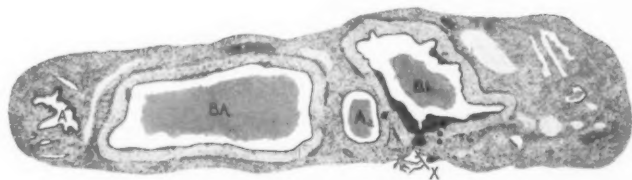FIGURE I (for legend see page 348).

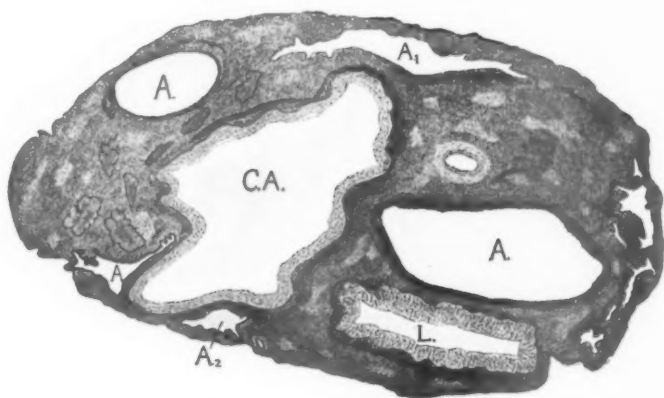FIGURE II (for legend see page 348).

FIGURE III (for legend see page 348).

Figure IV (for legend see page 349)

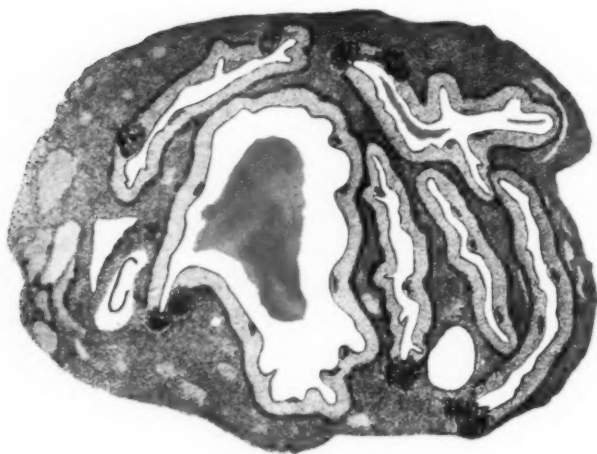Figure V (for legend see page 349)

Figure VI (for legend see page 349)

of subsequent reports the epithelium has been considered as the all-important feature and the life history of the cyst in which the epithelium occurs, of little consequence.

In 1905 Pick[8] described epithelium-lined blood cysts, which he referred to as *adenoma ovarii endometrioides.*

World-wide attention was directed to these cysts in 1921 by Sampson, who described them as perforating chocolate cysts, thus emphasizing their features of possessing chocolate (or tarry) material, and also of producing secondary implantations in the peritoneum by rupture and spilling of the contents. Though Sampson is responsible for directing special attention to these structures, they had been observed and remarked on by many surgeons and gynæcologists.

Two terms which have been applied to these cysts—endometrioma (Blair Bell[1]) and endometriosis (Sampson[10])—emphasize the similarity of the epithelium of the cysts to that of the endometrium. These names have arisen from the consideration of the epithelium to the exclusion of other components of the structure of the cysts.

Various hypotheses have been presented to explain the occurrence of the cysts:

1. An origin from various embryonic remnants of both the Wolffian and Müllerian ducts has been invoked, but these suggestions have been discarded in favour of other hypotheses.

2. Development from the serosa by metaplasia has been accepted by some investigators. All examples of "endometriomata" arise in relationship to the peritoneum or the corresponding surface epithelium of the ovary. For this reason and the occasional observation that the epithelium of the cysts may be traced into continuity with the serosal epithelium, the evidence seems convincing for some cases.

3. A very popular opinion at present is the hypothesis put forward by Sampson that the epithelium is actual endometrium which has been transplanted from the uterus to the ovary by way either of the Fallopian tubes or the veins.

Since none of these suggestions seemed to account adequately for many of the observations, and, indeed, the last-mentioned hypothesis seemed *a priori* an unlikely explanation, a number of specimens of typical "endometriomata" were examined by serial section.[1]

DESCRIPTION OF MATERIAL.

The specimens examined consisted of thirty typical examples of endometriomata of the ovary. In every case they were bilateral and the

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[1] In a previous paper[5] I accepted tentatively Sampson's hypothesis.

FIGURE IV. Camera-lucida drawing of a section taken from an "endometriomatous" ovary showing atretic follicles (A), and a retrogressing "luteal" blood cyst (of follicular origin), in which a partial epithelial lining is present, is also to be seen. Hæmatoxylin and eosin stain.

FIGURE V. Drawing of a section of a typical example of multiple tarry cysts. A = Atretic follicle. A_2 = Atretic follicle containing blood. L.B. = A retrogressing *corpus luteum* cyst. On the right side the cyst is lined by columnar epithelium with no luteal cells. The possibility of error in interpretation, if the section were taken in another plane through the end of this cyst, is obvious. The solid bodies arise from follicles by an atretic process in which proliferation rather than atrophy of the cells occurs.

FIGURE VI. Drawing of a section showing many blood cysts (blood has disappeared from some during preparation) of follicular origin. Many groups of glands are present in relationship to these cysts.

clinical history and results of examination were such that the diagnosis was made in most cases pre-operatively.

At operation the ovaries were enlarged and usually adherent to the surrounding structures in the pelvis. On some occasions there was chocolate material in the pelvis and several times small blood cysts were found in the bowel, uterus, broad ligament or other organs.

On macroscopic examination the ovaries were enlarged and contained many small dark blue cysts of varying sizes (from 3 millimetres to 2·5 centimetres or one-eighth of an inch to one inch in diameter). These cysts contained a chocolate or sometimes tarry material. Typical examples are shown in Figure I. These are illustrated to indicate that the condition dealt with is the typical "endometrioma".

Microscopically an extraordinary diversity of appearance is to be found. The most striking feature is the epithelial lining of the larger cysts and of the glands. It is with these structures that most observations begin and end.

FIGURE VII.   Photograph of a typical large tarry luteal cyst.

When a general review of a section of the organ is made, several features attract attention:

(a) The first feature is the number of Graafian follicles present, the majority of which are in an advanced stage of retrogression, constituting atretic follicles. These follicles present various appearances. Many of these are cystic and are lined by the cells of the *stratum granulosum,* which layer is disintegrating (see Figures II, III, IV, V *et cetera*). In most cases where this layer has entirely or almost entirely disappeared, the presence of the remnants of the *theca interna* layer renders the recognition of the cyst as of follicular origin easy.

It is sometimes stated that hæmorrhage does not occur into the cavity of an atretic follicle, but into the *theca interna* layer. As far as the normal ovary is concerned, I am in agreement with this statement, but in the case of ovaries containing blood cysts the presence of blood in the cavities of atretic follicles is a not uncommon finding (see Figure XII).

FIGURE VIII. Photomicrograph of a section of portion of the wall of an epithelium-lined cyst. The hyaline tissue (H) is obvious. × 100.

An important observation is the peculiar and characteristic appearance of the collapsed atretic follicle (see Figure II). During retrogression of the cysts, absorption of the fluid occurs and the cyst collapses irregularly, assuming an elongated appearance, and the wall becomes remarkably festooned. Thus all gradations may be found between the spherical cyst and the collapsed cyst. As stated, the lining of these cysts may be the *stratum granulosum*, which may be several layers or only one layer thick. The *theca interna* layer may be well developed, may be hyaline or be replaced by fibrous tissue. This fibrous layer is demarcated sharply from the ovarian stroma and readily distinguished from it, especially under the low power.

(*b*) The second item is the presence of luteal bodies in various stages of retrogression. Fully formed *corpora lutea* or luteal cysts are not very common,

FIGURE IX. Photomicrograph of portion of the wall of a luteal cyst showing the development of glands resembling endometrial glands in relationship to it. The examination of such a section without thorough investigation of the large cyst would inevitably lead to erroneous conclusions. × 30.

clinical history and results of examination were such that the diagnosis was made in most cases pre-operatively.

At operation the ovaries were enlarged and usually adherent to the surrounding structures in the pelvis. On some occasions there was chocolate material in the pelvis and several times small blood cysts were found in the bowel, uterus, broad ligament or other organs.

On macroscopic examination the ovaries were enlarged and contained many small dark blue cysts of varying sizes (from 3 millimetres to 2·5 centimetres or one-eighth of an inch to one inch in diameter). These cysts contained a chocolate or sometimes tarry material. Typical examples are shown in Figure I. These are illustrated to indicate that the condition dealt with is the typical "endometrioma".
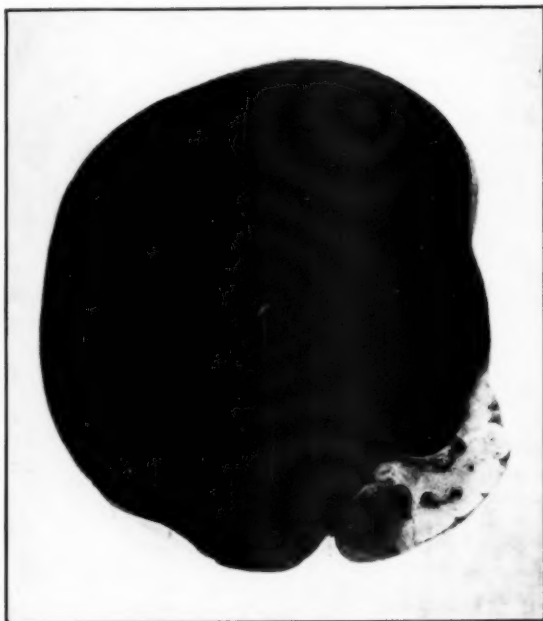
Microscopically an extraordinary diversity of appearance is to be found. The most striking feature is the epithelial lining of the larger cysts and of the glands. It is with these structures that most observations begin and end.

When a general review of a section of the organ is made, several features attract attention:

FIGURE VII.   Photograph of a typical large tarry luteal cyst.

(a) The first feature is the number of Graafian follicles present, the majority of which are in an advanced stage of retrogression, constituting atretic follicles. These follicles present various appearances. Many of these are cystic and are lined by the cells of the *stratum granulosum*, which layer is disintegrating (see Figures II, III, IV, V *et cetera*). In most cases where this layer has entirely or almost entirely disappeared, the presence of the remnants of the *theca interna* layer renders the recognition of the cyst as of follicular origin easy.

It is sometimes stated that hæmorrhage does not occur into the cavity of an atretic follicle, but into the *theca interna* layer. As far as the normal ovary is concerned,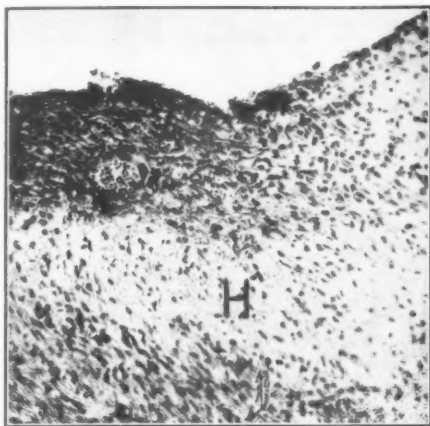 I am in agreement with this statement, but in the case of ovaries containing blood cysts the presence of blood in the cavities of atretic follicles is a not uncommon finding (see Figure XII).

An important observation is the peculiar and characteristic appearance of the collapsed atretic follicle (see Figure II). During retrogression of the cysts, absorption of the fluid occurs and the cyst collapses irregularly, assuming an elongated appearance, and the wall becomes remarkably festooned. Thus all gradations may be found between the spherical cyst and the collapsed cyst. As

FIGURE VIII. Photomicrograph of a section of portion of the wall of an epithelium-lined cyst. The hyaline tissue (H) is obvious. × 100.

stated, the lining of these cysts may be the *stratum granulosum*, which may be several layers or only one layer thick. The *theca interna* layer may be well developed, may be hyaline or be replaced by fibrous tissue. This fibrous layer is demarcated sharply from the ovarian stroma and readily distinguished from it, especially under the low power.

(*b*) The second item is the presence of luteal bodies in various stages of retrogression. Fully formed *corpora lutea* or luteal cysts are not very common,
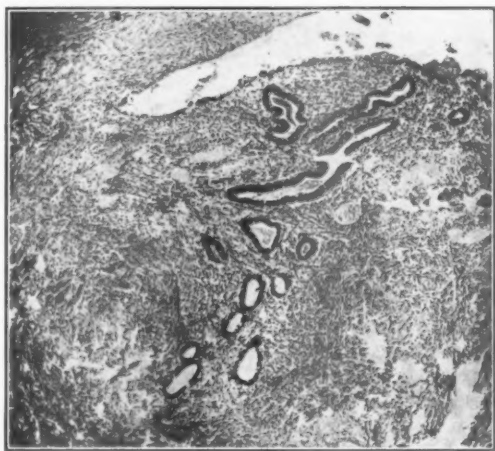

FIGURE IX. Photomicrograph of portion of the wall of a luteal cyst showing the development of glands resembling endometrial glands in relationship to it. The examination of such a section without thorough investigation of the large cyst would inevitably lead to erroneous conclusions. × 30.

but may be found occasionally (see Figure II). Rarely such structures
may monopolize the field.

(c) Cystic hyaline and fibrous bodies derived either from the *corpus
luteum* or the atretic follicles are frequently encountered. Sometimes
a typical *corpus albicans* tarry cyst is to be seen (see Figure III). More
frequently a blood cyst is to be observed in which there is not hyaline
but fibrous tissue in the wall, and yet the general arrangement of the
tissue and the gross morphology of the cyst indicate that it is of luteal
origin. Any of these cysts described above may be found containing
tarry material, yet without any epithelial lining.

(d) The next feature is the occurrence of epithelium as a lining
of cysts resembling any of these described (see Figure II). It occurs
in both dilated and collapsed cysts. These last structures show the same gross appearance that was discussed when referring to the collapsed atretic follicles. The comparison of an obvious collapsed follicular cyst and a collapsed cyst lined by columnar epithelium renders impossible any opinion but that they are intimately related (compare Figures X and XI). When these non-epithelialized cysts occur in association with epithelium-lined cysts, they are said to have the same origin as the epithelium-lined structures and originally to have possessed an epithelial lining which has been destroyed. The inadequacy of this opinion as an explanation of the observed phenomena is to be seen on

FIGURE X. An atretic follicle showing the general structure of a collapsed cyst. Compare Figure XI. × 20.

reference to sections. Sometimes the epithelium is flattened, at other
times cuboidal, and still others columnar, and it may occur in any one
form in one cyst, or all forms may be found.

Beneath this epithelium is to be found a stroma of round and
spindle cells. Crypts in the wall of a cyst are frequent, due in part
to the collapse of the cyst. When these are cut across, the appearance
of glands is obtained. This is to be found particularly at the end of
collapsed cysts (see Figure VI).

THE NORMAL OVARY.

That so little reference to the normal structure of the ovary is
made in most discussions of the epithelium-lined cysts of the ovary is

astonishing. When undertaking an investigation into these cysts, it seemed apparent that a study not only of the histology and physiology but of comparative anatomy was essential.

Little need be said concerning the formation and fate of the *corpus luteum*. The *corpus luteum* becomes the *corpus albicans* and any bodies occurring as intermediate stages between these two well marked varieties may be found. The formation of *corpus luteum* cysts and *corpus albicans* cysts has been described by many writers and is well illustrated from human material by Novak and TeLinde.[7]

The *corpora lutea* are less important, however, in

FIGURE XI. A collapsed epithelium-lined cyst. Compare Figure X. × 30.
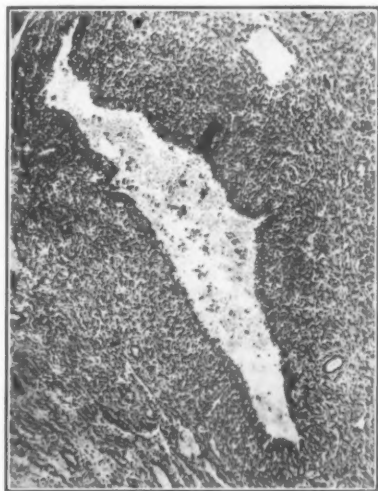
FIGURE XII. Photomicrograph of a typical atretic follicle, which shows both *stratum granulosum* and *theca interna* and which contains blood and phagocytic cells. × 30.

pathological changes than the atretic follicles. As a number of Graafian follicles approach maturity, the rupture of one, with the formation of the *corpus luteum*, is associated with retrogression or atresia of the others. It is computed that at birth there are from 10,000 to 100,000 ova in an organ, and since only from 400 to 500 follicles can come to maturity, the majority which retrogress at different periods during sexual life are responsible for the majority of the bodies to be found in the ovary.

The various changes occurring during atresia may be followed most readily in animals. In the platypus (*Ornithorhynchus anatinus*), where the ovum is relatively large and a follicular cavity is absent, atresia may occur by absorption of the ovum

in situ or by rupture of the follicle on to the surface of the ovary.

In the first case the cells of the follicle epithelium, the *stratum granulosum*, grow into, phagocytose and displace the ovum. They in their turn disintegrate and are replaced by hyaline tissue. When atresia is associated with rupture, most of the ovular material is lost into the peritoneal cavity or into the Fallopian tube, but any remaining is also invaded by the cells. Various appearances are to be found according to whether much or little yolk is present and also

FIGURE XIII. Photomicrograph of a section of a typical luteal cyst which has developed an epithelial lining. × 10.

FIGURE XIV. Photomicrograph of portion of an epithelium-lined cyst. The fibrous tissue, sharply demarcated from the ovarian stroma, derived from the luteal tissue is well shown. × 20.

whether hæmorrhage, which frequently occurs in the *theca interna* layer, occurs also into the central region. The reader should refer for details to such a paper as that of Mary L. Garde.[4] I have also seen in the platypus examples of follicular cysts arising in follicles undergoing atresia.

Similar changes occur in the ovaries of the fish, reptiles and birds where the follicles contain no follicular cavity.

In the higher animals (Eutheria) still further changes occur. In small follicles, before the formation of the *antrum folliculi*, the changes resemble those described above.

In the more mature follicles the characteristic change is a proliferation of the cells of the *theca interna* layer and a retrogression of the *stratum granulosum*. This is associated with some degree of distension, greater or smaller, of the follicle, often resulting in cyst formation. Not infrequently a variant of this change resembling the change referred to above takes place and as well as proliferation of the theca layer there is also a proliferation of the granulosa cell layer.
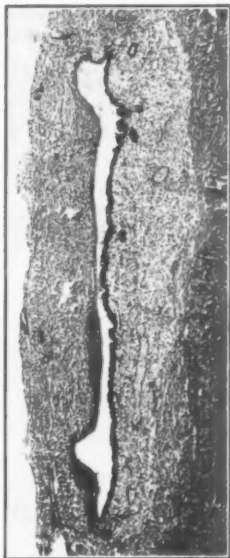
FIGURE XV. Photomicrograph of an epithelium-lined cyst (of follicular origin) lying close to the surface of the ovary. Compare Figure XVI. × 15.

FIGURE XVI. Photomicrograph of an epithelium-lined cyst which has ruptured on the surface of the ovary. The projection of portion of the wall with its glands and stroma outwards is worthy of note. Compare Figure XVII. × 15.

Hyaline changes occur in all of these bodies, thus giving rise to further structures. Sometimes fibrous tissue change occurs instead of hyaline change, giving still further appearances. A further complication is the not infrequent occurrence of hæmorrhage, either around or into these bodies. Various stages of some of these structures are illustrated in the figures.

In *résumé*, we see that there are numerous structures of various sizes, some solid and others possessing cavities, with varying thickness of wall and in some of which fibrous or hyaline material may have replaced to a greater or less extent the original cells occurring in the

region. It is not desirable to consider these here in detail, since even a brief, if complete, account would be very extensive.

Not only in the lower animals, but also and, indeed, particularly in human ovaries, numerous cysts, the pathological counterparts of those structures described, may be found in which the tissue in the wall corresponds to that of the various bodies which are traced from the derivatives of the Graafian follicle, particularly the atretic follicles. In many of the cysts derived from atretic follicles the cells resemble atypical luteal cells, so that the cysts are often referred to as "luteal" cysts. The cysts arising from the *corpora lutea* are commonly referred to as *corpus luteum* cysts in contradistinction to the "luteal" cysts mentioned. This terminology which has been applied to the tarry luteal cysts, may be applied also to the multiple blood cysts of the ovary.
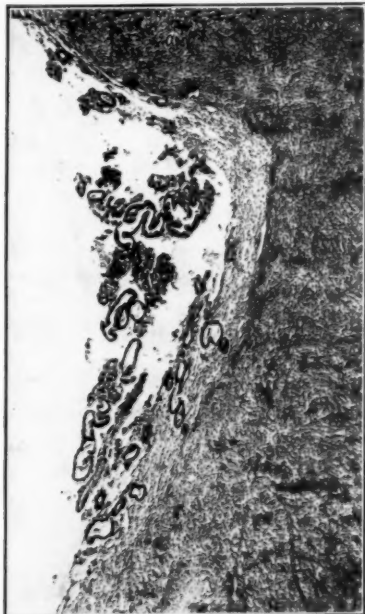
FIGURE XVII.   Photomicrograph of a section showing a ruptured epithelium-lined blood cyst on the surface of the ovary. This appearance, commonly seen, appears to support Sampson's implantation hypothesis, but as can be seen by comparing Figures XV and XVI, the explanation given here is more probably correct.   × 15.

EPITHELIUM-LINED CYSTS.

In 1887 Nagel described some ovarian cysts which he considered to be luteal. His opinion has not been accepted generally, because proof of their nature was thought to be absent.

Proof of the derivation from the follicle of the various structures described above may be obtained in two ways: (i) Examination of cysts of doubtful origin by serial section often reveals that the retrogressive changes occurring in the cyst wall have not progressed at an equal rate throughout, and definite evidence of their origin is to be obtained in some part of the wall; and (ii) examination of a large series of cysts demonstrates all gradations between the various types from the obvious cystic atretic follicle up to the most atypical form.

When blood cysts are encountered, several atypical features are found to have been introduced. Blood occurs frequently in the cavities of follicular cysts of ovaries which are the site of "endometrial" cysts (see Figures II and V). The presence of the blood results in a marked

reaction in the wall, numerous blood vessels are found and connective tissue cells replace the tissue present and grow into the clot in the cavity. Also numerous phagocytic cells which may (and I consider that the observations of biology justify the conclusion) have differentiated from luteal cells are to be found.

An epithelial lining in my experience develops only in cysts which do contain or have contained blood.

As stated, any of the cysts described as arising from the atretic follicle—or *corpus luteum*—may possess this lining in whole or in part. Some of these are illustrated. Thus a cyst lined by luteal tissue may show columnar cells (see Figures IV and V). In cases in which only a slight degree of hyalinization occurs the heterotopic epithelium may occur in some or other part of the wall, usually in a part where the luteal cells are most altered. This is important from the point of view of possible errors in interpretation, unless careful examination of the whole of such cysts be made.

Cysts showing hyaline or fibrous change in the luteal tissue most frequently show the typical lining (see Figures II and XIII).

One characteristic feature of all the follicular and luteal bodies of the ovary is the gradual absorption of the contents and the collapse of the structure until, if cystic, it becomes markedly crenated. As stated previously, this gives a distinctive appearance to the majority of the bodies. The crenation or irregular festooning of the wall results in the formation of crypts, and when these crypts are cut in section a glandular appearance is obtained (see Figures VI and IX). It will be seen that, in some cases, the association of such glands with a larger cyst of luteal or follicular origin may be determined readily, but if the section is taken in another direction the association will be demonstrable only by serial section. I do not wish to labour this point, since its accuracy may be determined by an investigation of specimens. In addition, the glands appear to have a definite power of growth into the surrounding tissue (see Figures II and VI). The counterpart of such invasion is to be seen, in other parts of the body, in the invasion of stomach or gall-bladder walls by epithelial glands in certain inflammatory states.

The observation that the development of hyaline and fibrous material from the luteal tissue in the wall may not have progressed to the same extent in all parts of the cyst, is very illuminating from the point of view of the numerous hypotheses put forward to explain these cysts.

Luteal tissue may be found in one part, hyaline tissue in another and fibrous tissue in still another. In some cases while there is tissue of luteal origin in one aspect, only stroma tissue is present in some other part (see Figure V). It is obvious that if one plane of section in one slide does not show the relationship, and if one section only be examined, the true relation of the epithelium will not be appreciated.

One important feature is the occurrence of glands on and near the surface of the organ. Many appearances will be found that appear

to support Sampson's implantation hypothesis, but examination again demonstrates the follicular nature of the cysts, though distortion has occurred and much of the cyst wall may have disappeared (see Figures XV, XVI and XVII). Usually, however, sufficient evidence is at hand or may be obtained by serial sections.

Small glands are frequently observed close to the surface of the organ, but in my experience they may usually be traced to a neighbouring cyst. Sometimes glands may be seen to arise from the surface epithelium of the ovary. Since this derivation of the glands is much less important than the follicular origin, it is only mentioned here in passing.

Finally there is the problem of the development of the epithelium in blood cysts. A consideration of most of the cysts indicates that they are undergoing retrogression. The luteal tissue (of either *corpus luteum* or atretic follicle origin) has changed and been replaced to greater or less extent by hyaline or fibrous tissue, the cysts have collapsed and evidence of absorption of the contents (blood and blood derivatives) is to be seen in the wall in the form of pigment, cholesterol crystals and pigment-containing phagocytes. The epithelium is to be found in those cysts in which these indications of retrogression and absorption of the blood are most marked. This suggests that the epithelium is developed as a functional adjuvant to the absorption of blood. Direct evidence of this view is obtained from the morphology of the epithelium; for example, the polarity of the cell is reversed, the nucleus often lying at the periphery of the cell and many vacuoles and granules lying in the basal portion of the cell. This and other observations are to be considered in detail in another paper. The morphology of the subepithelial stroma also strongly suggests that it takes part in some absorptive mechanism.

In conclusion, it may be stated that epithelium-lined blood cysts of the ovary are derived from the Graafian follicles either by way of the *corpus luteum* or more commonly the atretic follicles, that they are a late stage of the life history of those cysts into which hæmorrhage has occurred, and that possibly the epithelium is directly associated with the absorption of the cyst contents. The epithelium and the subepithelial stroma thus are the physiological reaction of the tissues of the wall of the blood follicle to the presence of the blood.

SUMMARY.

1. Epithelium-lined blood cysts of the ovary occur as two principal varieties: the large (usually single) tarry luteal cysts and the multiple small cysts.

2. The multiple small cysts (often referred to as endometriomata) are shown to be derived from the follicles of the ovary either by way of the atretic follicles or *corpora lutea*.

3. The epithelium arises as an incidental phenomenon in the retrogression of follicular or luteal blood cysts.

ACKNOWLEDGEMENTS.

REFERENCES.

[1] W. Blair Bell: "Endometrioma and Endometriomyoma of the Ovary", *Journal of Obstetrics and Gynæcology of the British Empire*, 1922, Volume XXIX, page 443.

[2] O. Brakeman: *"Beitrag zur Klinik und Pathologie der Teercysten des Eierstocks"*, *Archiv für Gynäkologie*, 1928, Volume CXXIX, page 632.

[3] L. Fraenkel: *"Der Bau der Corpus-luteum Cysten"*, *Archiv für Gynäkologie*, 1898, Volume LVI, page 355.

[4] M. L. Garde: "The Ovary of the Ornithorhynchus, with Special Reference to Follicular Atresia", *Journal of Anatomy*, 1930, Volume LXIV, page 422.

[5] E. S. J. King and J. Fiddes: "A Clinical and Pathological Study of Endometriosis", THE JOURNAL OF THE COLLEGE OF SURGEONS OF AUSTRALASIA, 1929, Volume I, page 303.

[6] V. Nagel: *"Beitrag zur Anatomie gesunder und kranker Ovarien"*, *Archiv für Gynäkologie*, 1887, Volume XXXI, page 327.

[7] E. Novak and R. W. TeLinde: "The Pathological Anatomy of the Corpus Luteum", *The Bulletin of the Johns Hopkins Hospital*, 1923, Volume XXXIV, page 289.

[8] L. Pick: *"Über Neubildungen am Genitale bei Zwittern, nebst Beitragen zur Lehre von den Adenomen des Hodens und Eierstockes"*, *Archiv für Gynäkologie*, 1905, Volume LXXVI, page 191.

[9] W. W. Russell: "Aberrant Portions of the Müllerian Duct Found in an Ovary", *The Bulletin of the Johns Hopkins Hospital*, 1899, Volume X, page 8.

[10] J. A. Sampson: "The Life History of Ovarian Hematomas (Hemorrhagic Cysts) of Endometrial (Müllerian) Type", *American Journal of Obstetrics and Gynecology*, 1922, Volume IV, page 451.

[11] W. Shaw: "Pathological Forms of the Corpus Luteum", *Journal of Obstetrics and Gynæcology of the British Empire*, 1927, Volume XXXIV, page 300.

NEUROBLASTOMA: EXPERIENCES AT THE ROYAL ALEXANDRA HOSPITAL FOR CHILDREN, SYDNEY.

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AND

H. R. Sear,
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Part I.—Pathology.
(Frank Tidswell.)

The pathological observations herein recorded were made upon two children diagnosed as suffering from neuroblastoma, mainly on the evidence furnished by X ray examinations which revealed the changes discussed in the second part of this paper. Nevertheless, there was observable a quite distinct symtomatology which was easily enough recognized in the second child after the experience gained with the first, and which may be briefly stated preliminary to citation of the pathology.

Clinical Histories.

The patients were a boy of six and a girl of three years of age, both of whom succumbed from exactly similar illnesses.

The boy had joint pains fifteen months earlier, but these had disappeared. Some three months previously he complained of pains in the chest and back which lasted one month. He then had a fall and was said to have been concussed, and after that remained ailing up to the time of his admission to hospital.

The girl had no accident nor acute onset of her illness. She came of a family with tuberculosis on both sides, but she herself did not react to the von Pirquet test, and showed no signs of tuberculosis at autopsy.

As regards the cases under review, both children developed malaise and steadily increasing asthenia. On admission to hospital both were unable to walk, though there was no paralysis nor muscular wasting. In the boy there was weakness in the arms, but this was not present in the girl. The boy had incontinence of urine and fæces without any manifest lesion of the parts. No defect of mentality or of speech was present. The girl was subject only to phases of irritability and screaming.

Protrusion of the eye with hæmorrhages was present in both patients on the left side, subconjunctival in the boy and subdermal in the eyelid of the girl. Further hæmorrhages were found *post mortem*. Both patients had irregular bossing of the skull, and wide though not open suture lines. The boy had a pathological fracture of the neck of the left femur.

Each patient had a large tumour in the abdomen, which was attached to the posterior wall. In the girl a soft pelvic tumour was found only when search was made after the X ray report. In the boy the tumour was abdominal and

manifest to palpation from the first. There was no abdominal protrusion nor visible external evidence of the growths. There was a group of enlarged glands of the boy's right femoral triangle. The girl had enlarged upper cervical glands.

FIGURE IA. Photograph (two-thirds natural size) of abdominal tumour in the boy. Posterior surface showing flattened right suprarenal body and the normal left suprarenal and kidney.

Both children had marked pallor. The boy's blood showed numerical anæmia (3,200,000 erythrocytes per cubic millimetre), with normal hæmoglobin, no structural changes in the red cells, but an occasional normoblast, and a leucopenia (5,000 cells per cubic millimetre) due to lack of marrow cells (neutrophile cells 3,500, eosinophile cells 80), the extramedullary cells (lymphocytes 1,200 and monocytes 250) being normal. There were no primitive types. The girl's blood was also anæmic (3,750,000 erythrocytes per cubic millimetre), with hypochromæmia (colour index 0·7), slight struc-

tural defects, but again only an occasional normoblast; but in her case there was no leucopenia (9,200 per cubic millimetre), and the white cells were of normal proportions. Thus in the boy there was interference with both erythropoiesis and leucopoiesis, but in the girl only with erythropoiesis. The restraint was limited to the marrow, neither having any deficiency in lymphocyte production. The type of anæmia revealed was suggestive of reduction in the amount of marrow, for example, substitution of marrow by neoplastic tissue.

Both children became progressively more asthenic and cachectic until, exhausted by their illness, they died, the boy in fifteen months and the girl three months after onset.
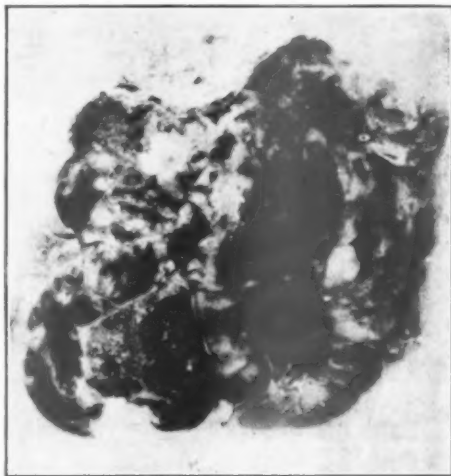
FIGURE IB. Photograph (two-thirds natural size) of abdominal tumour in the boy. Section showing interior of the growth and normal right kidney.

The duration in the boy is dated from his "rheumatism", joint pains being described as an early manifestation of the neuroblastoma.

Thus in summary both these children had abdominal tumours with metastases in the skull and ecchymoses about the eye, changes in the bones generally giving the characteristic X ray picture, accompanied by an anæmia suggesting more or less obliteration of marrow by new growth, and marked enfeeblement becoming continuously worse till death.

Post Mortem Findings.

These clinical similarities were paralleled by the *post mortem* findings.

The abdominal tumours in both cases were found to have originated in the suprarenal bodies. In the boy the right suprarenal body was concerned. Growing from it was a tumour which intervened between the gland and the kidney, separating them by several inches, extending back to the posterior abdominal wall to which it was attached, and across the abdomen into contact with the left kidney and suprarenal body (see Figures IA and IB). Of these four structures only the right suprarenal body was affected. It had lost the characteristic shape, and sat upon the upper pole of the tumour as a yellow, flattened, worm-like band, about 6·25 centimetres (two and a half inches) long, attached only in part of its length. The two kidneys and the left suprarenal body were normal in position, shape and appearance. After removal, the tumour was about the size of a large coconut and had massed together within it the abdominal vessels *et cetera*, which remained distinct and apparently uninjured. It was as if the tumour had soaked round them without invasion or destruction. There were no secondary growths in any of the abdominal viscera.

In the girl the tumour was associated with the left suprarenal body (see Figure II). Again the growth intervened between gland and kidney, separating them by about 3·75 centimetres (one and a half inches). It extended backwards and downwards into the pelvis, which it practically filled. The suprarenal body appeared again as a yellow, flat band some 5·0 centimetres (two inches) long, seated on the upper pole of the tumour and attached only in part. The attach-

FIGURE II.   Various portions of the growth in the girl. Below: the two kidneys, the right with a nodule of growth attached to pelvis; the left with a portion of the main growth between it and the flattened suprarenal body. Above: the *dura mater* and growth stripped off the fronto-parietal bones, and the button of growth on the sternum.

ments of this tumour to the wall of the pelvis and its largely diffluent condition prevented complete removal. In this case there was another apparently independent (possibly secondary) nodule of growth the size of a walnut near the right kidney, but not invading it in any way. The abdominal viscera were free from any signs of growth.

Both tumours were irregularly lobulated, bluish-red as seen through the peritoneal covering, deep red with yellowish patches on section, varying from semi-fluid to quite solid consistency in different parts. They contained areas of necrosis and calcification.

In both children there were metastases in the skull, involving the fronto-parietal region, the frontal plates, ethmoid and wings of the sphenoid. There were no metastatic deposits in the middle or posterior fossæ. These metastases appeared as flattened subdural protuberances composed of the same deep red material as in the suprarenal growth and of the same soft character (see Figure II). The frontal growths had penetrated the orbit and caused hæmorrhage and proptosis. The brain substance showed no evidence of disease.

In both cases there were also growths in the thorax. In the boy, nodules were present on the sixth and ninth left ribs (see Figure IV), and there was a chain of nodules on both sides, apparently corresponding to the intercostal

FIGURE III.   Section showing growth developing from suprarenal gland medulla.

lymph glands, the left upper one projecting 5·0 centimetres (two inches) into the upper pleural sac. In the girl there was a button of growth on the upper part of the sternum (see Figure II), and at the back of the thorax a chain of nodules similar to those in the boy. The lungs and heart were normal in both cases.

The other gross lesions noted were the enlarged glands in the girl and the swelling in the femoral triangle in the boy, which was found to be due to enlarged lymphatic glands.

The *post mortem* examination confirmed the clinical findings, defined the extent of the lesions and extended them to regions out of clinical reach. The tumours were shown to originate in the suprarenal, to be massive in the abdomen and widespread in the bones.

Histological Appearances.

In correspondence with the two previous sections, the histological appearances were alike in the two cases. Microscopic sections of the tumours where they abutted on the suprarenal bodies showed their origin from the medulla of that gland. The unattached part had normal medulla with cortex on both sides. The

attached part had cortex on one side only; on the other side the medulla and cortex were replaced by tumour (see Figure III). In its growth from the medulla the tumour had carried away the cortex on the issuing side. The cortex in the girl was otherwise free from growth, but in the boy two finger-like processes had penetrated it, pushing aside and compressing the cortical cells without destroying them.

The tumour mass is composed of cells without regular form and arrangement, their appearance immediately suggesting a primitive type (see Figure V). They are gathered in various numbers in groups separated by thin and imperfect fibrous bands. Their nuclei are round, oval, pear-shaped, sometimes polylobed, being rather more regular in the boy (the longer case). They are hyperchromatic and mostly in mitosis. There is little cytoplasm and no intercellular substance and no orderly relationship. Rosettes were met with only in some places in the boy. There was no differentiation in either case, there were no ganglion cells and no pigmented cells. The fibres of the partition bands appeared to be nervous tissue with intermixture of ordinary fibrous tissue. Most of the bands are vascular, and very many carry the wide sinus-like blood spaces which give the tumour its deep red colour.

These masses of cells in migrating about the retroperitoneal space had engulfed most of the structures there encountered: arteries, veins, nerves *et cetera*, but had left them intact, surrounded and not invaded, and this applied also to sympathetic ganglia seen within the mass. Lymphatic glands, however, were not spared, but were penetrated and disrupted in the usual way.

The growths on the cranial and other bones were composed of precisely the same material as that in the abdominal tumour. Detailed examination showed that the visible growth in all cases was continuous with a much more widely spread growth in the interior of the bones. The marrow was occupied and largely replaced by tumour cells which ranged widely, penetrating even the smaller Haversian canals of the compact bone (see Figures VII and VIII). Outranging processes had formed the visible subdural or subperiosteal tumours (see Figure VI). Such occupation of the marrow was found also in bones not showing any external signs of disease, for example, ribs, sternum and femur, so that although the opportunity for a thoroughly wide examination was lost, there

Figure IV. Transverse section of rib showing growth in medulla. At top growth has penetrated periosteum and is invading intercostal tissues.

was valid reason for the inference that the tumour tissue was in general occupation of the marrow, and thus accounted for the general mottling revealed by X ray examination as later described (see Figure XV).

The thoracic and abdominal viscera and the brain were all free from growth. Even the kidneys, so closely invested by the abdominal masses, were inviolate; the growth did not spread beyond the capsule. On the other hand, lymphatic tissue seemed to be regularly invaded, tumour cells lying alongside lymphocytes

surviving in remnants of glands which appeared normal, and which sometimes showed active germ centres (see Figure IX). Cortex and medulla of the enlarged glands showed columns of invading tumour cells which also filled the efferent lymphatic vessels at the hilum, so passing through (see Figure X). At the edges of the growths finger-like processes of the tumour could be seen advancing along endothelium-lined spaces. These conspicuous evidences of local lymphatic spread were supplemented by the absence of growth from the local adjacent blood vessels. Nevertheless, it is presumed that the widespread bone marrow metastases were due to dispersal by the blood stream, which could be entered so easily through the extensive sinusoidal vascularity of the tumour. It is very remarkable in the circumstances that such viscera as the liver and lungs and kidneys should have
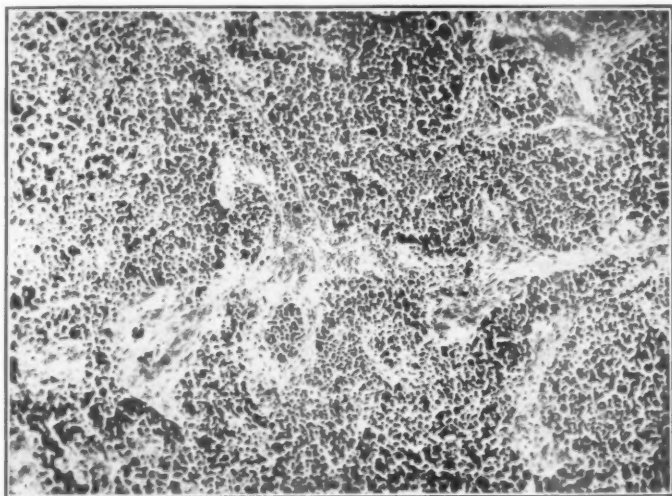
FIGURE V. Abdominal mass showing irregular type of cells and arrangement, with thin and imperfect fibrous bands.

escaped. Otherwise the tumour follows the well-known predilection of suprarenal tumours to metastasize in the bone marrow.

Comment.

The histological appearances described are those of neuroblastoma, a tumour formerly regarded as sarcoma, but now associated with immature sympathetic nervous tissue. Some idea of the embryology of sympathetic tissue is necessary to its appreciation.

The sympathetic nervous system takes its origin from cells—sympathogonia—which emigrate from the central medullary axis and develop in three main lines of ganglia—the prevertebral chain, the collateral chain (cardiac, cœliac plexuses et cetera) and the terminal chain (suprarenal medulla and intestinal plexuses of Auerbach and Meissner). In so far as the suprarenal medulla is concerned, further

development is along two lines. The sympathogonia produce either sympathoblasts, which become ganglion cells, or they produce phæochromoblasts which become phæochromocytes (chromaffin or adrenaline cells). Failure to differentiate regularly gives rise to a series of tumours composed of cells representative of the stage reached. Thus there may be sympathogonioma, that is, neuroblastoma as more commonly called, or the derivative sympathoblastoma and ganglion cell neuroma on the one side, and phæochromoblastoma and phæochromocytoma (paraganglioma, chromaffinoma) on the other. The relationship of these to each other and to the corresponding develop-

FIGURE VI. Tumour tissue extruding from cranial bone (above) and lying between it and the *dura mater* (below).

SCHEMA SHOWING EMBRYOLOGY OF NERVOUS SYSTEM.

Epiblast
——— Ependyma (Ependymoma)

Neuroepithelium (Medulloblasts)——————————Sympathogonia
(Medulloblastoma)   (Sympathogonioma : neuroblastoma)

Neuroblasts   Spongioblasts   Sympathoblasts   Phæochromoblasts
(Neuroblastoma)   (Spongioblastoma)   (Sympathoblastoma)   (Phæochromoblastoma)

Neurocytes   Astroblasts   Ganglion cell   Phæochromocytes
(Neurocytoma)   (Astroblastoma)   (Ganglioneuroma)   (Phæochromocyto-
                                                                          Chromaffinoma
                       Astrocyessa   Paraganglioma)
                       (Astrocytes)

FIGURE VII. Femur showing tumour tissue in medulla.
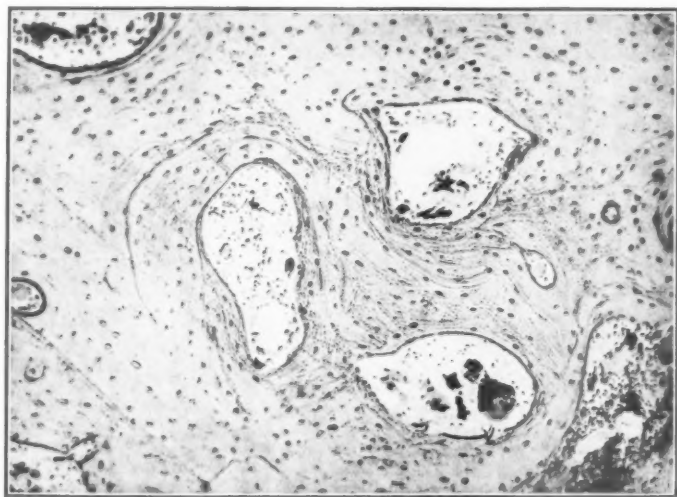
FIGURE VIII. Femur showing tumour extending along Haversian canals of cortex.
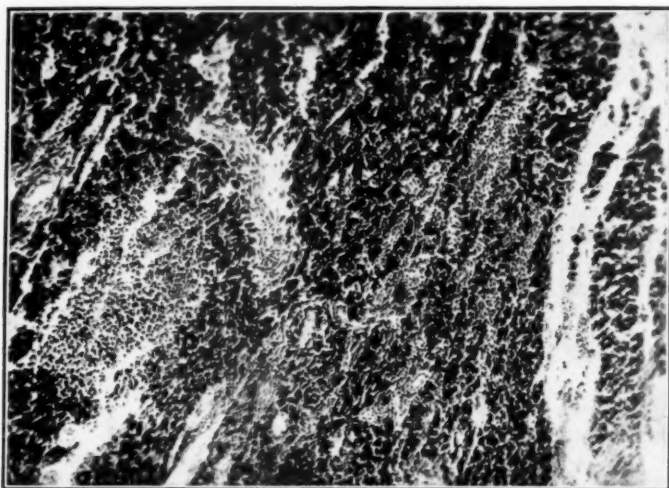
FIGURE IX.   Femoral lymph gland cortex showing tumour under capsule
and permeating lymphatic tissue.
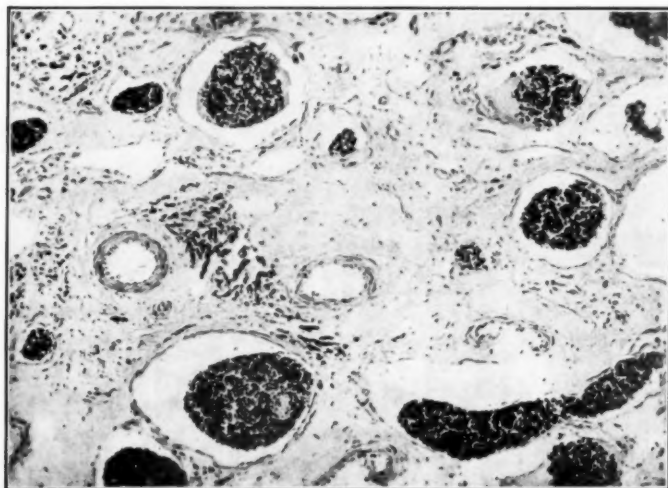
FIGURE X.   Femoral lymph gland.   Hilum showing tumour tissue emerging
by lymphatic vessels.   Blood vessels free.

mental stages of the central nervous system are given in the accompanying schema. Neuroblastoma, ganglion cell neuroma and paraganglioma have been reported pure and in conjunction with sympathoblastoma and phæochromoblastoma. The latter intermediate types have not been found pure: as might be expected, some of their cells achieve further differentiation and become mature. As far as concerns our present subject, the tumour is the neuroblastoma—the early and very undifferentiated type of these sympathetic growths. The lack of manifest nerve or chromaffin cells and the unrestrained highly malignant behaviour of the tumours are thus accounted for.

In summary, these issues, clinical, pathological and histological, are concordant in showing that these two children were both afflicted with the malignant disease formerly classed as adrenal sarcoma, but now called neuroblastoma. In both there was a massive abdominal growth which had originated in the undifferentiated formative sympathetic tissue of the suprarenal medulla. The gland was not destroyed, the emergent tumour had perforated and carried away one section of the cortex only and spread locally along lymphatic channels. From the primary site it had metastasized through the blood widely into the bones, occupying the marrow, and extruding here and there as subdural and subperiosteal tumours. In the eye this resulted in proptosis and hæmorrhages in both cases, and this observable feature seems to be specially distinctive. The invasion of the bones is not limited, as these tumours would indicate, but is so generalized as to dominate the condition. It is responsible for the general mottling so characteristic in the X ray pictures which suggest that few bones escape. In the microscopic sections it can be seen displacing the marrow and so causing the pronounced anæmia from which the children suffered. Its great aggregate extent must have made it a factor, perhaps even more important than the abdominal mass, in producing the cachexia and asthenia which characterize and finalize these cases.

There are two recognized clinical types of "adrenal sarcoma", the Hutchinson type with metastases in the cranial bones (ecchymoses in the eyelids et cetera), and the Pepper type with metastases in the liver. P. S. Frew has suggested that these types depend on which suprarenal is involved, the paths thence being different in the two glands. Tumours of the left suprarenal body invade liver (Pepper), tumours of the right suprarenal do not (Hutchinson). As our cases reveal tumours of the right and left suprarenals respectively, and both were of the Hutchinson type, Frew's explanation would appear to be inadequate.

Acknowledgements.

D

PART II.—RADIOLOGY: A BRIEF REVIEW OF THE RADIOGRAPHIC FEATURES OF EIGHT HITHERTO UNREPORTED CASES OF METASTATIC BONE INVOLVEMENT IN NEUROBLASTOMATA.

(H. R. Sear.)

When the lesion under review, namely, the involvement of bones secondary to neuroblastomata, was first encountered in the X Ray Department of the Royal Alexandra Hospital for Children, we were
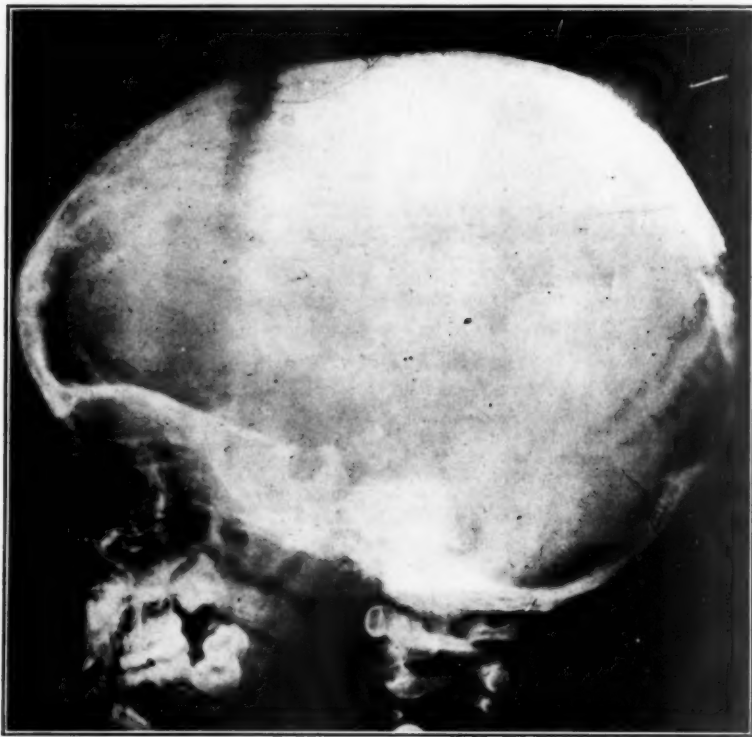
FIGURE XI. Skull of E.F. First case. Female, aged two years and five months. Note the widening and stretching of the sutures, the worm-eaten appearance of the frontal bone, and the irregular mass near the vertex with a vertical spiculation suggestive of sarcoma.

frankly nonplussed by the appearance of the bones. Among the possible diagnoses suggested was lymphadenoma. Such a diagnosis was prompted by the fact that the first child, a girl aged two and a half years, had definite tumours over the skull, and radiographically there was vertical trabeculation extending upwards from the periosteum into these masses,

the appearance being suggestive of lymphadenoma of bones, which, in my opinion, is commoner than is generally supposed. This mass, with its bony trabeculation, and the enlarged cervical glands rendered the diagnosis of lymphadenoma likely. Excision and section of a gland, however, showed that the mass was not lymphadenomatous, but malignant.

FIGURE XII. Skull of A.L. Second case. Male, aged two years and three months. Showing still more widening of the coronal suture and the worm-eaten type of osteoporosis in the cranium, especially of the frontal bone.

The worm-eaten appearance of the cranial bones bears a striking resemblance to the malignant infiltration of the skull seen at times in metastatic involvement from carcinoma of the breast; this should, I think, have warned us that we were dealing with a secondary malignant lesion.

Soon after the first two cases were seen at the Royal Alexandra Hospital for Children, Carye-Belle Henle's article, with its accompanying Röntgenograms, appeared in America, and the diagnosis was established, namely, that the primary lesion was a neoplasm arising in the sympathetic nerve system, with a characteristic secondary spread to both skull and long bones.

FIGURE XIII.   Skull of E.L.   Seventh case.   Male, aged five years and six months. Primary growth in the right suprarenal body.   Note the generalized worm-eaten appearance.   The widening of the sutures, though present, is not so advanced as in the previous patients.

In the last five years seven cases have been seen at the Royal Alexandra Hospital for Children and one at the Royal Prince Alfred Hospital, in which the radiographic diagnosis appeared to be that of neuroblastoma; unfortunately some of these have not been verified by autopsy.

There has been a striking similarity in the histories of these eight patients, so much so that a diagnosis is now as a rule possible on clinical findings alone.

There are marked pallor and anæmia, languor and tiredness; in one or two cases there has been marked irritability of temperament. Anorexia is pronounced. The children develop an uneven temperature, running up to 38·9° to 39·4° C. (102° to 103° F.). There is marked enlargement of the glands, especially the cervical group; of the other glands the inguinal appear to be the most commonly involved, but the cervical glands in this series, as in the majority of reported cases, are those most affected. If the glandular involvement occurs indirectly through the bones, as has been suggested, then these are the glands that one would expect to be most affected. There may be tumours on the skull, ranging up to two or three inches in diameter. At times the veins over the head are unusually prominent, and may seem on clinical examination to lie in grooves over the skull. Proptosis is a very constant

Name.[1]	Age.	Sex.	Leg Symptoms.	Red Cells per Cubic Millimetre.	Colour Index.	White Cells per Cubic Millimetre.	Percentage of Polymor-phonuclear Cells.	Percentage of Lympho-cytes.
E.F.	2 years, 5 months.	F.	" Developed a limp."	1,080,000	0·8	8,000	50	45
A.L.	2 years, 3 months.	M.	" Went off his feet."	2,120,000	0·7	9,300	57	34
V.C.	1 year, 8 months.	F.	" Unable to use right leg."	2,670,000	0·5	7,600	16	67
B.G.	3 years, 6 months.	M.	" Won't attempt to walk."	2,480,000	1·04	6,800	46	45
R.B.	4 years.	M.	" Unable to walk owing to pains in legs."	1,450,000	0·5	5,100	52	32
E.L.	5 years, 6 months.	M.	" Pain and swel-ling of both ankles."	3,200,000	0·1	5,000	70	24
L.D.	3 years.	F.	" Will not walk."	3,750,000	0·7	9,200	66	22
H.	4 years.	F.	Pains in legs and tenderness.	2,700,000	0·6	6,500	74	18

[1] The first seven patients were seen at the Royal Alexandra Hospital for Children, the eighth case occurred at the Royal Prince Alfred Hospital.

feature, often preceded, so it is stated, by ecchymosis, but ecchymosis in this series was not invariably present. The most constant clinical sign is the refusal of the child to walk or to use its legs, which may be exquisitely tender to the touch and at times swollen. This sign is explained by the fact that in all the cases under review the bony changes were much more advanced in the leg bones than in those of the upper extremities. This sign was present in some of the cases reported in the literature, but I feel that it must be stressed as it appears to be so constant. The accompanying table gives the age, sex, and indicates the leg symptoms (as obtained from the histories).

The condition occurs apparently mainly in young children, and it does not seem to affect those of one sex more than those of the other.

It has been the custom to separate the secondary neuroblastomata into two types: the one, described by Hutchinson, with extensive osseous

FIGURE XIV.   Postero-anterior skiagram of the same patient, demonstrating the
type of osteoporosis and the widening of the sagittal suture.

involvement, with unilateral exophthalmos, and enlargement of the regional lymph glands; the other (Pepper) much more rapidly fatal, with progressive distension of the abdomen without ascites, with enlargement of the liver and at times jaundice, and pain and fever. It is not proposed to deal further with this aspect of the lesion. Our series have all shown bone involvement of varying degree, though proptosis has not been an invariable feature.

The duration of the disease in this series has varied greatly. In one patient, although the changes were very advanced in both cranial and long bones at the first X ray examination, the progress was very slow; the bone changes were watched over a period of eight or nine months. In another child, the third of this series, with but slight changes in the long bones and without the typical skull, death occurred within ten weeks.

The hypothesis was advanced by Frew that only left sided tumours metastasize to bones, and that those in which the primary growth is near or in the right adrenal body, did not affect bones. This hypothesis has not been borne out in this series, nor did it pertain in some of the other reported cases, for example, those of P. A. Bendixen and F. H. Lamb. In our series proptosis has occurred or been more marked on the side in which the abdominal tumour occurs, a feature previously described; but this must not be regarded as a constant sign, for in the case described by Bendixen and Lamb the tumour was in the right adrenal body, but the proptosis affected the left eye.

In describing the X ray features, I shall deal first with the skull and then with the long bones.

Skull.—Three well marked changes may be seen in the skull.

1. A worm-eaten appearance of the bones of the calvarium, and at times of the bones about the orbits. This appearance is widespread, but in our cases is most pronounced in the area about the coronal suture and bregma. This, in my experience, is the area of the skull usually most involved by metastases from mammary carcinoma. Its similarity to the fine widespread metastatic involvement from mammary carcinoma has been mentioned before.

2. The widening or diastasis of the sutures, especially the coronal and sagittal.

3. The presence of masses that may occur on the cranial bones, with a fine bony trabeculation extending vertically into them from the periosteum, the appearance suggesting sarcoma or lymphadenoma. This is not as constant a feature as the first two changes.

Long Bones.—Two definite changes are present in the long bones.

1. A patchy worm-eaten appearance throughout the bones, with, at later stages, the occurrence of uniformly transradiant areas of varying size; at times a pathological fracture may be encountered, though this is uncommon.

2. Periostitis along the greater part of the shafts of several of the long bones. At times the elevated periosteum is intact, at times inter-

FIGURE XV. Femur of E.F. First case. Aged two years and five months. Note the generalized worm-eaten appearance, the periosteal reaction, and the large oval transradiant area towards the lower end of the diaphysis. The pelvic involvement can also be seen.

FIGURE XVI. Femur of B.G. Fourth case. Aged three years and six months. Male. The worm-eaten appearance and periosteal reaction are definitely present, but not so obvious as in Figure XV.

FIGURE XVII.

FIGURE XVIII.

Femur and tibia of E.L. Seventh case. Male, aged five years and six months. Note the worm-eaten, irregular appearance of the bones, the periosteal reaction (most noticeable in the femur) and the small transradiant area in the centre of the upper end of the tibial diaphysis. The disease in this patient ran a very chronic course. The primary was in the right suprarenal region.

rupted, with occasional "lipping" somewhat similar to that seen occasionally in sarcoma.

Drawing an analogy from the appearance of the skull in widespread fine metastatic involvement from mammary carcinoma, it seemed radiographically that the worm-eaten appearance, not only of the skull, but of the long bones, represented a fine diffuse infiltration in the bony tissue by secondary new growth. The larger areas appear to represent a replacement of the bone by the aggregation and confluence of these small areas, with consequent absorption of the intervening bony trabeculæ.

The periosteal overgrowth is possibly due to a stimulation of its bone-forming property resulting from the irritation of the widespread neoplastic infiltration. The gaps in the periosteum would appear to result from the destruction of the neoplasm overtaking, as it were, the periosteal new bone formation, and thereby causing its erosion. This suggestion is somewhat contrary to the view of the causation of the periosteal elevation advanced by Karelitz in leuchæmia, for he writes that:

From observations made in cases of chloroma and allied conditions, it may be assumed that in leukæmia the periosteal elevation may be the result of infiltration of lymphoid or myeloid cells penetrating the bone cortex along the course of the lymphatic vessels, eroding it and spreading out in the subperiosteal area, lifting off the periosteum.

The point raised may require modification after further extensive microscopic examinations of the shafts of those long bones that show only early radiographic involvement.

In all our cases the changes radiographically in the bones of the inferior extremities have been more marked than those in the arms, which would account for the refusal of the children to use their legs.

The sequence of events in the long bones appears to be first the advent of the worm-eaten appearance, often followed almost immediately by the periosteal elevation and
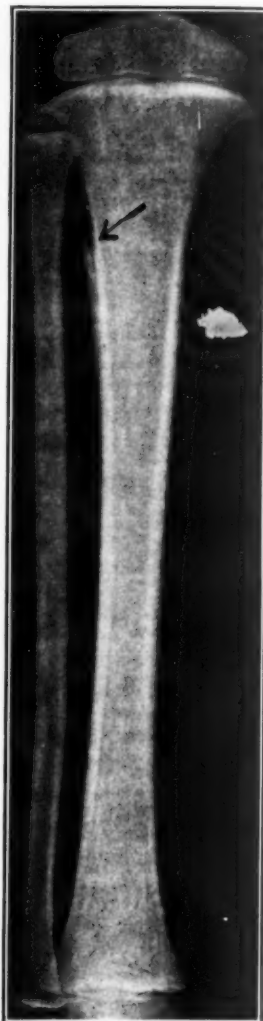
FIGURE XIX. Tibia of eighth case. H., female, aged four years. The changes were very marked and typical in the skull, but very slight in the long bones. The primary was in the right suprarenal region. Note the lipping on the lateral aspect of the upper end of the tibial diaphysis, somewhat suggestive of sarcoma.

new bone formation, and later the occurrence of well marked masses within the long bones. A pathological fracture is a late and uncommon complication.

These bone changes are depicted in the accompanying skiagrams.

Differential Diagnosis.

In reviewing the differential diagnosis, we must consider it from two aspects, that of the long bones and that of the skull.

The Long Bones.

Traumatic and infective periostitis and osteomyelitis offer no difficulty in diagnosis. Of generalized periosteal ossifications, those occurring in syphilis and scurvy present characteristic X ray pictures. It is well said (Karelitz) that "periosteal elevation which is non-syphilitic and not scorbutic in origin in childhood should suggest the possibility of leukæmia or allied conditions, or neoplasm such as neuroblastoma".

The diseases to be differentiated are:

1. Von Jaksch's anæmia, and the curious form of bone changes and anæmia described by Cooley, Witwer and Lee. In both these conditions the long bones show increased transradiancy and porosity with larger, looser trabeculation and thin sharply defined cortex. In the latter condition the skull is distinctive. These conditions are not characterized by the extensive generalized periostitis of the metastases of neuroblastomata.

2. Gaucher's disease is also characterized by marked general osteoporosis with loose coarse trabeculation and sharply defined cortex, and the occurrence, through destruction of the spongiosa, of areas of transradiancy of varying size (see Kirklin and Hefke's case). There may be a widening of the long bones, especially of the lower thirds of the femoral shafts (Fischer's sign). Walt, Rosenthal and Oppenheimer regard this as the commonest early bone change in Gaucher's disease. Usually, however, no marked widespread periosteal elevation is seen in Gaucher's disease. It is to be noted that in Junghagen's case there was definite periosteal elevation in the legs, but it was not generalized. In Gaucher's disease it would seem that it is most likely to occur towards the joints. Compression of the diseased bones, especially of the femoral heads, has been reported by Junghagen, Muller, Santee et alii, and at times the changes may suggest tuberculosis of the hip. Should the cranium be involved in lipoid histiocytosis (Schüller's disease) the skull appearance is at once diagnostic.

3. The leuchæmias, both lymphatic and myeloid, may show a worm-eaten appearance of the long bones and, rarely, periosteal elevation. This may be generalized, and it may possible necessitate a Röntgenogram of the skull to establish the radiographic diagnosis.

4. Among the late manifestations of lymphoblastoma there may occur patchy irregular areas of osteoporosis in the long bones. Evans

and Leucutia point out that lymphosarcoma in its final stage may change to lymphatic leuchæmia, and then such bone changes are seen.

5. Finally, it must be noted that in the secondary deposits from primary pulmonary carcinomata periosteal elevation with subsequent erosion of the cortex may occur over fairly extensive areas. These changes may be generalized, affecting both arms and legs; but they are usually, though not invariably, most marked towards the ends of the diaphyses. It seems now that some of the cases described radiographically as pulmonary osteoarthropathy are due to metastases from primary carcinomata of lungs. It is to be noted that in Pierre-Marie Bamberger's disease the lamellar type of periostitis may be absent from the metacarpus and metatarsus, and yet well marked in the bones of the legs and forearms.

The Skull.

As regards the skull changes, widening of the sutures may occur in children from neoplasms of the brain, but if due to this cause there is not a generalized worm-eaten appearance of the cranial bones. A worm-eaten appearance of the cranial bones in adults may occur from metastatic spread from mammary carcinoma, but this is a possibility that we do not have to consider in these young infants. The adult skull in syphilis of the cranial bones is characteristic, but I have yet to see such a condition radiographically in a young child.

In conclusion, I must mention the difficulty and at times the impossibility of differentiating chloroma. It has been held that changes in the skull and long bones identical with those of secondary neuroblastoma may occur in chloroma. In Gould and Lewald's case no *post mortem* examination was made. Karelitz's case, thought to be chloroma, turned out at autopsy to be secondary neuroblastomata. In Karschner's verified case of chloroma the changes are described as identical with those of secondary neuroblastoma, but in this case the examination of the long bones revealed no abnormality. It must be remembered, however, that chloroma is intimately related to leuchæmia and therefore changes may be expected in the long bones in this condition. In Washburn's case of chloroma the bone changes were different; in this patient the porosis of the cranial bones was of a different character and much more sharply defined and localized and in it the long bones showed patchy osteoporosis and extensive areas of destruction, but in spite of very extensive destruction in the femoral shaft, no marked periosteal elevation is obvious in the reproductions of the skiagrams of the long bones. Therefore it would seem that chloroma varies considerably in its bony changes. It may approach very closely to neuroblastoma in its radiographic features and is without doubt the most likely lesion to be mistaken for secondary neuroblastomata, and it seems that at times cannot be differentiated from it.

ABDOMINAL INCISIONS IN THE LIGHT OF RECENT WORK ON THE INTERCOSTAL NERVES.

By Francis Davies and Cecil P. G. Wakeley.

[From the Hambleden Department of Anatomy, King's College, London, and King's College Hospital, London.]

Abdominal surgery forms a large part of present day surgery, and one of its fundamental requirements is adequate access to any part of the abdominal cavity at the least possible cost of damage to the nerves and musculature of the abdominal wall. The musculature of the anterior abdominal wall consists of two parts—the medial supporting column consists of the recti and pyramidales muscles. The recti form a broad "strap-like" musculature, enclosed within a strong fibrous sheath, which helps to maintain the intraabdominal pressure in virtue of its powerful compression of the abdominal viscera. The lateral abdominal musculature comprises the external and internal oblique muscles and the transversalis. These muscles exert a constant pull in a transverse direction in virtue of their common insertion through the rectus sheath into the *linea alba*. This fact must be borne in mind when planning an abdominal incision, and it may be noted that from this anatomical point of view there is much to be said in favour of transverse incisions.

The Anatomy of the Intercostal Nerves.

The following account of the anatomy of the intercostal nerves is based on the recent work of Walmsley[1] and of Davies, Gladstone and Stibbe.[2]

The muscles of each intercostal space form four planes from without inwards, as follows:

(1) *External Intercostal Muscle.*—The external intercostal muscle is replaced by the anterior intercostal membrane between the costal cartilages. Its fibres are directed downward and forward from the lower border of the upper rib to the outer lip of the upper border of the lower rib.

(2) *Internal Intercostal Muscle.*—Behind the angle of the rib the internal intercostal muscle is replaced by the posterior intercostal membrane. Its fibres are directed downward and backward. Its upper attachment is to the floor of the subcostal groove, over which it spreads out like a carpet on the deep aspect of which lie the intercostal nerves and vessels.

(3) *Intracostal Muscle.*—The intracostal muscle is approximately coextensive with the internal intercostal muscle, but becomes more membranous in its anterior part. Its fibres are directed downward and backward. Muscular below, its fibres end above in a thin membranous sheet which is attached to the upper (or inner) lip of the subcostal groove. Owing to the transparency of the endothoracic fascia and of the upper part of the intracostal muscle, the main trunks of the intercostal nerves and vessels are plainly visible from the inner aspect of the undissected thoracic wall. Below, the intracostal muscle is attached to the upper part of the inner surface of the lower rib.

(4) *Subcostal Muscle.*—The subcostal muscle is limited to the posterior part of the space and is best developed in the lower spaces. Its fibres are directed downward and backward. It is attached to the inner surfaces of adjacent ribs, though many of the fibres pass over two spaces before receiving attachment.

Plane of the Intercostal Nerves and Vessels.

The intercostal nerve and its divisions lie for the main part of their course between the internal intercostal muscle and the intracostal muscle. This plane corresponds to that which the lower nerves occupy when they pass into the abdominal wall, namely between the internal oblique and transversalis muscles. These lower nerves, therefore, to gain the abdominal wall, merely pass through the connective tissue which lies between the interdigitating slips of attachment of the *transversalis abdominis* and diaphragm on the inner surfaces of the costal cartilages. The same remarks apply to the intercostal vessels in the chest wall and to those intercostal vessels which enter the abdominal wall.

Branching of the Intercostal Nerves.

The conception of a single nerve running the length of an intercostal space is incorrect. Behind the region of the angle of the rib the intercostal nerve certainly exists in the form of a single stem which, however, consists of two or more nerve trunks closely applied to each other and wrapped up in a common sheath (see Figure I). These nerve trunks separate from the common stem of the intercostal nerve in front of the angle of the rib, but the stem can be artificially separated behind the angle of the rib into the three nerves into which it normally divides in front of the angle of the rib. The terminal divisions of the intercostal nerve stem are as follow:

(1) *The "Main" Intercostal Nerve.*—The "main" intercostal nerve runs forwards in the upper part of the intercostal space between the internal intercostal and intracostal muscles to end as the main anterior cutaneous nerve by the side of the sternum (the abdominal course in the case of the lower nerves is considered below).

(2) *The Lateral Cutaneous Nerve.*—The lateral cutaneous nerve is the largest of the three divisions. For a variable distance in front

of the angle of the rib it runs forward bound up in the same sheath as the "main" intercostal nerve. It leaves the latter nerve when near the mid-axillary line and runs very obliquely through the internal intercostal muscle, the "space" between the internal and external intercostal muscles, and the external intercostal muscle, to become cutaneous between the digitations of the *serratus magnus* or external oblique muscle. It is to be noted that this is the only large nerve in the space between the internal and external intercostal muscles and that it occupies this space only for a very short distance as it passes obliquely on its way to the skin.

(3) *The Collateral Branch of the Intercostal Nerve.*—The collateral branch of the intercostal nerve, like the "main" intercostal nerve, in its thoracic course lies entirely between the internal intercostal and intracostal muscles. It leaves the common intercostal nerve stem at the angle of the rib and immediately runs downward to the lower part of the intercostal
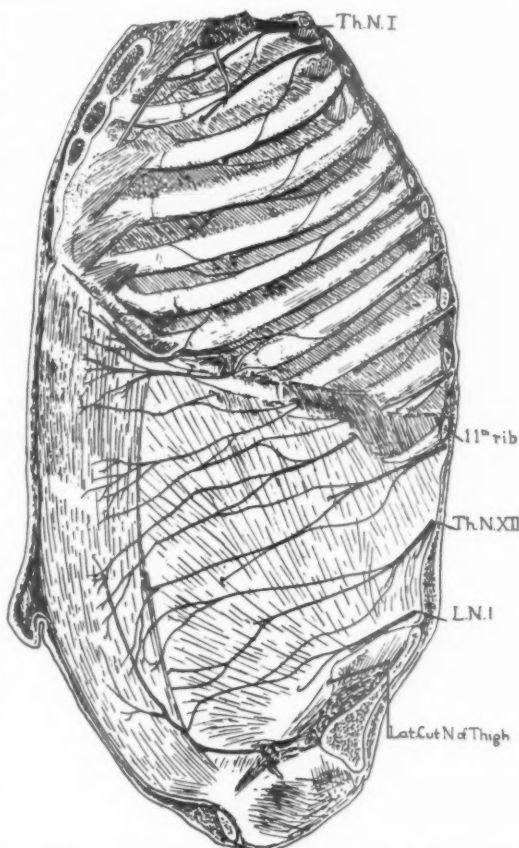
FIGURE I. From the dissection of a human fœtus. The pleura, subcostal, intracostal and transverse abdominal muscles have been removed and the thoracic and abdominal muscles exposed from the inner side. A typical intercostal nerve is seen to divide into three main branches: (i) an upper, which terminates as the principal anterior cutaneous nerve; (ii) an intermediate branch which is bound up in the same sheath with the main branch for a variable distance before leaving it to become the lateral cutaneous nerve; (iii) and a collateral branch which is given off in the posterior part of the space and then courses along the lower part of the space for a considerable distance. It may then rejoin the main nerve and finally terminate with it as the anterior cutaneous nerve, or it may again separate from the principal nerve and terminate as an accessory cutaneous nerve. Communicating branches are seen crossing the inner surfaces of the ribs. The same subdivision of the main nerve into three principal branches and communications with adjoining intercostal nerves is seen in the abdominal wall as that which takes place in the thoracic wall. (By permission of the *Journal of Anatomy*.)

space, whence it continues forward near the upper border of the rib. In the anterior part of the intercostal space the collateral nerve generally rejoins the "main" intercostal nerve, and then runs forward for a short distance, bound up in the same sheath with the main nerve, only to
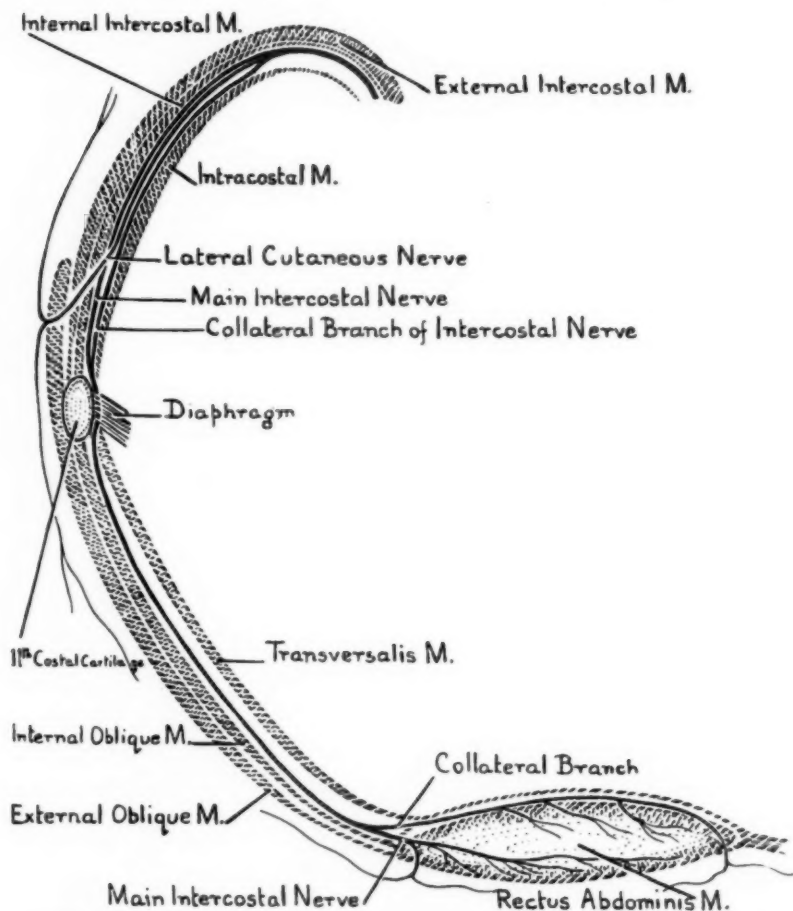
FIGURE II.   Diagrammatic representation of section of trunk along the course of the tenth intercostal nerve (viewed from above).

separate from it again and terminate as an accessory anterior cutaneous nerve by the side of the sternum (at the lower part of the space). Sometimes the collateral nerve sends only a communicating twig to the

main nerve in the anterior part of the space and itself continues independently to become cutaneous. (Its abdominal course is considered below.) Both the "main" and collateral nerves supply branches to the intercostal musculature and to the costal parietal pleura. In addition, the common trunk behind the angle of the rib supplies a fairly large branch to the external intercostal muscle.

Course of Lower Intercostal Nerves in Abdominal Wall (Figures I and II).

The lower intercostal nerves commonly pass between the digitations of the *transversalis abdominis* and diaphragm as a single trunk, the collateral nerves supply branches to the intercostal musculature and to in the chest wall. Sometimes, however, the main and collateral nerves remain separate and join only after a short course in the abdominal wall. The nerve trunk formed by the junction of the main and collateral nerves passes towards the *rectus abdominis* and in most cases redivides into two nerves immediately lateral to the outer border of the rectus. Thus far, the nerves in the abdominal wall lie between the internal oblique and *transversalis abdominis* muscle sheets (in a plane corresponding to that which they previously occupied in the thoracic wall). In this part of their course (that is, between the diaphragm and the *rectus abdominis*) there is a free plexus formation by means of communicating branches between neighbouring intercostal nerves, and by "stripping" the nerves backwards from the outer border of the rectus muscle it can be demonstrated that any one nerve trunk at the lateral border of the rectus contains fibres derived from at least two and in most cases three intercostal nerves. (See above also for communications between the nerves in the chest wall.)

Distribution to the Diaphragm.—Each of the lower six thoracic nerves gives branches to the upper and lower aspect of the diaphragm as it passes from the thoracic to the abdominal wall. The branches are derived from both the "main" and the collateral nerves. The branch from the seventh intercostal nerve to the diaphragm is usually single, large, and given off from the single trunk formed by reunion of collateral and main divisions above the diaphragm. Kiss and Ballon[3] conclude that these branches are sensory, though Felix[4] attributes motor function to the branch from the last dorsal nerve. The results of clinical avulsion of the phrenic nerve seem to indicate that it is the sole motor supply to the diaphragm.

Distribution to the Rectus Abdominis Muscle and the Overlying Skin (Figures II and III).—Immediately lateral to the outer border of the rectus muscle each nerve divides into two branches, an upper and a lower. The upper represents the "main" nerve and the lower the collateral nerve. The "main" (upper) nerve enters the back of the rectus muscle in the region of the corresponding tendinous intersection (in the case of the upper abdominal nerves) and near the lateral border of the muscle. Here it almost immediately divides into three sets of branches, one to the muscle segment above the tendon, one to the muscle segment

E

below, and an anterior cutaneous branch which enters the skin near the *linea semilunaris*, and is a member of the lateral series of anterior cutaneous nerves. It is to be noted that the muscular branches of the "main" nerve occupy approximately the outer two-thirds of the rectus
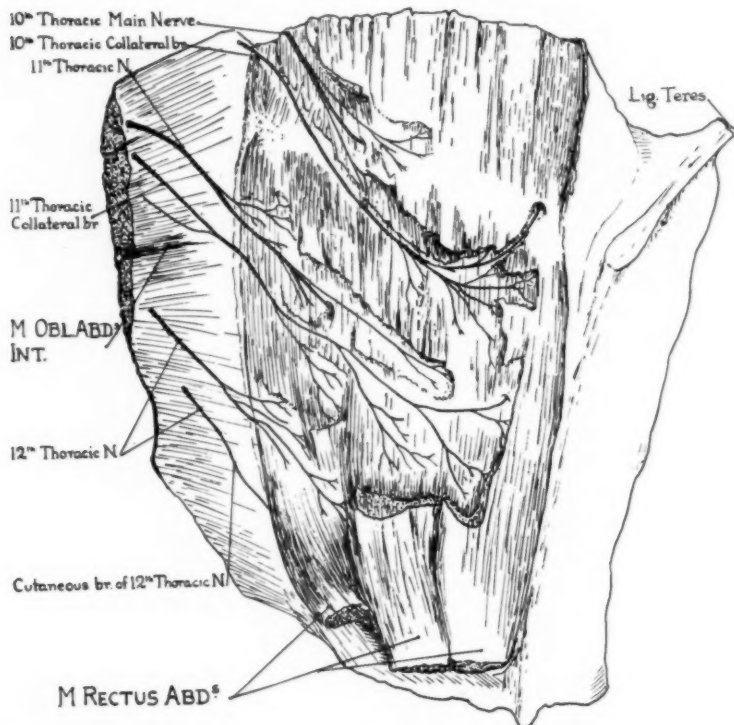
FIGURE III. From a dissection of the abdominal wall as viewed from behind. The transverse abdominal muscle and the posterior wall of the sheath of the *rectus abdominis* muscle have been removed. The terminal distribution of the tenth, eleventh and twelfth thoracic nerves is seen to consist of an upper and lower branch. The upper branch, after having given off muscular branches to the rectus muscle, ends as the lateral anterior cutaneous branch. The lower branch gives off branches to the muscle and finally terminates as the medial anterior cutaneous branch. The drawing indicates the relationship of the nerve fibrils to the *lineæ transversæ* and the superficial, intermediate and deep strata of the rectus muscle. (By permission of the *Journal of Anatomy.*)

muscle, and that they lie mainly in a more anterior plane than the muscular branches of the collateral nerve. Fine communications take place between the branches of the "main" and collateral nerves in the substance of the muscle. The collateral (lower) nerve enters the back of the rectus muscle a little below the corresponding tendinous inter-

section and nearer the mid-line than the "main" nerve. It gives numerous muscular branches which occupy the inner two-thirds of the muscle, and which lie mainly in a more posterior plane than that occupied by the branches of the "main" nerve. In the substance of the rectus it communicates by means of fine branches with its own "main" nerve and with the "main" nerve below. Finally the collateral nerve ends as the medial anterior cutaneous nerve near the *linea alba* and just below the tendinous intersection. It is to be noted that each segment of the rectus is innervated by at least two, and more commonly (owing to the intercommunications in the abdominal and thoracic walls) three spinal nerves. In the lower part of the rectus there are usually no tendinous inscriptions, but the lower nerves have a course and distribution corresponding to that of the upper ones.

Individual Abdominal Nerves.—Between the diaphragm and the outer border of the rectus muscle, as stated above, the nerves for the main part consist of single trunks, although the collateral and "main" nerves may remain separate for some part of their abdominal course, and free communication exists between neighbouring nerves. The seventh and eighth intercostal nerves, immediately on passing between the interdigitating slips of the *transversalis abdominis* and diaphragm, lie behind the rectus muscle and here they are definitely inclined upwards. The ninth intercostal nerve is the only nerve of this series which pursues approximately a horizontal course in the abdominal wall. The lower nerves increase in downward obliquity as they course forward in the abdominal wall. The twelfth thoracic nerve, which communicates below with the ilio-hypogastric nerve, for the main part passes in front of the lower part of the rectus, supplying, in addition, the *pyramidalis abdominis* muscle.

BLOOD SUPPLY OF THE ANTERIOR ABDOMINAL WALL.

The blood vessels of the lateral part of the anterior abdominal wall are derived from the two lowest intercostal vessels, the lumbar vessels, the ascending branches of the deep circumflex iliac vessels (which ascend approximately in the line of the anterior superior spine of the ilium) and the superior, inferior (deep) and superficial epigastric vessels. These vessels (except the superficial epigastric) lie in the same intermuscular plane as the nerves. The vascular supply of the skin of the anterior abdominal wall is such that there is no danger of sloughing of the skin as a result of damage to any particular vessel.

ABDOMINAL INCISIONS (Figure IV).

The customary abdominal incisions may now be reviewed in the light of the topography of the abdominal nerves. Although, owing to the plexus-like communications of the nerves in the abdominal wall, incisional hernia is not a common sequel even of the extensive and variable incisions that are commonly practised, yet it must be maintained that adequate and direct access to the region of operation should inflict

a minimal amount of damage to the muscles and nerves of the abdominal wall. The vascularity of the abdominal wall, as stated above, is so plentiful that even division of the epigastric vessels does not seriously endanger the vitality of the tissues.
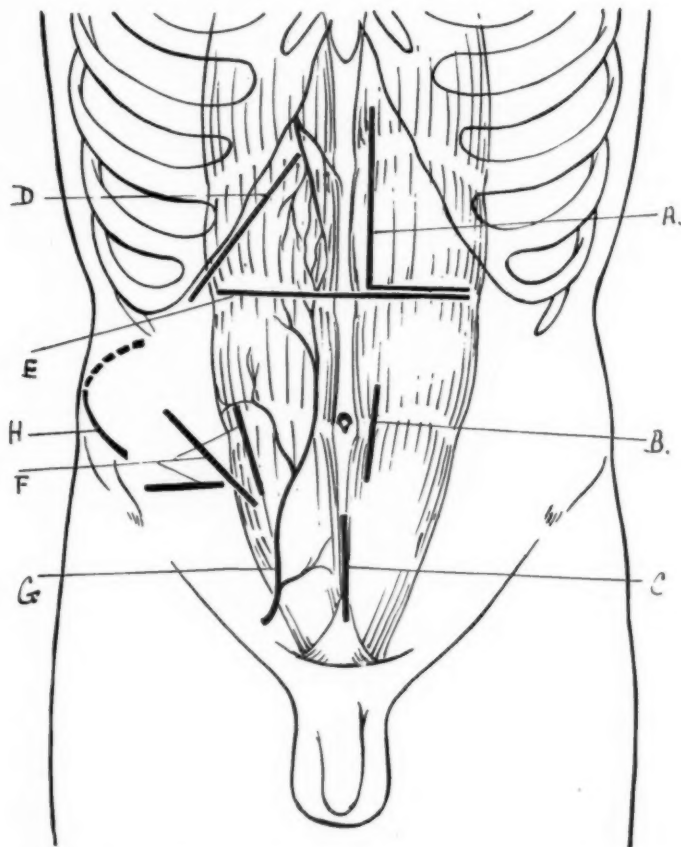
FIGURE IV. Abdominal incisions. A = incision for splenectomy; B = paramedian incision; C = incision for prostatectomy; D = subcostal incision; E = transverse incision; F = incisions for removal of appendix; G = deep epigastric artery; H = kidney incision.

The Paramedian Incision.—The paramedian incision in which the anterior wall of the rectus sheath is opened, the rectus displaced outwards and the posterior wall of the sheath incised, is an excellent incision in most respects. In it no muscle fibres are cut, the nerves are not

damaged, adequate exposure can be obtained, and the incision can be extended in an upward and downward direction without damage to muscle or nerves, and, finally, the scar tissue consists of the same tissue as the rectus sheath. Its only disadvantage lies in the fact that the strain on the abdominal wall when the patient breathes, coughs or vomits is in a transverse direction, that is, at right angles to the direction of the incision.

Transverse Incisions.—Transverse incisions are more extensively employed at the present time than in the past. Anatomically and physiologically they are sound, in that the nerves will suffer minimal injury and the strain of coughing *et cetera*, is in the line of the incision and will tend to approximate, rather than separate, the edges of the wound. Transverse supraumbilical incisions heal rapidly and soundly. Moreover, in this situation, the transverse incision can be carried through one of the tendinous intersections in the rectus muscle, injury to many muscle fibres thus being avoided and the resulting scar tissue being situated in the intersection rather than in the muscle. To prevent retraction of the rectus muscle within its sheath after division (through the intersection), it is necessary to stitch the sheath to the underlying muscle both above and below the tendinous inscription prior to its division. In this manner excellent access is obtained for operations on the gall-bladder, bile ducts, stomach, duodenum and spleen. If the patient has a narrow subcostal angle, however, a transverse supra-umbilical incision may not give such a good exposure as a paramedian one, but the combination of paramedian and transverse incision provides excellent access for operations on the biliary tract or hepatic flexure of the colon on the right side, or on the spleen or splenic flexure of the colon on the left.

Incisions through the Linea Semilunaris.—Immediately lateral to the rectus muscle, as shown in the earlier part of this paper, the inter-costal nerves exist in the form of single trunks (the "main" and collateral nerves having previously rejoined either in the thoracic or abdominal wall). Incisions in this region are therefore unsound both from the fact that the main trunks of the nerves are cut and from the relation of subsequent stress to the direction of the incision. Hernia is a frequent sequel.

Subcostal Incisions.—Subcostal incisions are parallel to and a little below the costal margin. They are anatomically unsound, as they endanger the main trunks of the intercostal nerves emerging from behind the costal cartilages on their way to the upper part of the rectus. The scar tissue resultant upon such incisions is often excessive and the largest incisional herniæ that have been reported, have been in cases in which subcostal incisions have been employed. Moreover, less adequate exposure is permitted than by the combination of a paramedian and a transverse incision.

Mid-Line Incisions.—Mid-line incisions, whether above or below the umbilicus, except those immediately above the pubis for bladder opera-

tions, are not entirely satisfactory. The pull of the lateral abdominal musculature frequently causes a weakness in the scar region, and there is no support in front or behind the scar. Its sole advantage is the entire avoidance of injury to the abdominal nerves.

Oblique Incisions.—Oblique incisions through the lateral abdominal wall can be so planned that the incision is as far as possible in the same line as the intercostal nerves. These incisions are employed for exposure of the kidney and ureter. If prolonged towards the rectus, these incisions provide excellent approach to the caecum and ascending or descending colon.

Exposure for Removal of the Appendix.—Of the variety of incisions that have been employed for the removal of the appendix, the following two are most to be advocated. (i) The "grid-iron" incision. This gives excellent exposure of the ileo-caecal angle and the appendix. The skin may be incised in a transverse direction (see Figure IV), or it may be divided together with the external oblique muscle for 7·5 centimetres (three inches) in the direction of the fibres of that muscle (see Figure IV) by an incision inclined about 40° to the mid-line. The internal oblique and transversalis muscles are then divided in the direction of their fibres. If more room is required, the anterior wall of the sheath of the rectus can be incised in the direction of the nerves, and the rectus retracted inwards. The eleventh intercostal nerve should not be damaged if care is taken not to traumatize the muscles by excessive use of metal retractors. If the operator tries to work through too small an incision and excessive retraction of the divided muscles is made, even the twelfth thoracic nerve may be damaged and right inguinal hernia may possibly result. The "grid-iron" incision is a "valvular" one in that the fibres of external oblique have a different direction from those of the internal oblique and transversalis, and each layer is incised in its line of strain. Even when this incision is used to open an appendix abscess, if adhesions follow, they are likely to involve only the caecum and not the small intestine. (ii) The paramedian incision. This incision is employed if a more extensive exploration of the abdominal cavity is required, and has the advantage that it can be extended upwards and downwards without damage to nerves or muscle and the resulting scar is sound. Battle's incision, which is made just medial to the *linea semilunaris* with inward displacement of the rectus, is unsound in that the eleventh and twelfth thoracic nerves are endangered. Hernia is not an uncommon sequel to such an exposure.

Incision for Sigmoid Colostomy.—The two incisions commonly employed for sigmoid colostomy are: (*a*) the left iliac incision, which is a "grid-iron" incision, similar in every respect to that used on the right side for exposure of the appendix, and (*b*) the paramedian incision, in which the left rectus, instead of being displaced, is split longitudinally and the sigmoid colon brought to the surface through this opening. We are of the opinion that the paramedian incision has the following advantages over the "grid-iron" incision: (*a*) There is more sphincteric

control; owing to the overlap in the innervation of the rectus, there is no appreciable weakness of this muscle. (*b*) A larger cap can be worn without any possibility of it rubbing against bony prominences (a median cap is more comfortable). (*c*) Inguinal hernia is not a possible sequel of the operation.

Incisions for Bladder Operations.—A median subumbilical incision is better than a paramedian incision for bladder operations, especially for prostatectomy. The recti are left intact within their sheaths and the lower abdominal nerves are undamaged. Hernia is not a common sequel. Moreover, the peritoneal cavity is not opened. If a paramedian incision is used, adequate exposure is difficult to obtain, owing to the pull of the recti and pyramidales near their origin. Also, if the bladder is septic, excessive scar tissue results in the lower part of the rectus.

CONCLUSIONS AND SUMMARY.

1. The course and divisions of the intercostal nerves in the thoracic and abdominal walls are described in the light of recent work on this subject.

2. The extensive inter-communications between neighbouring nerves, both in the thoracic and especially in the abdominal walls, are noted.

3. Although, owing to these inter-communications, post-operative hernia (apart from sepsis) is not a common sequel even of the wide and variable incisions that are commonly practised, yet the endeavour should always be made to inflict the minimal damage to the nerves and musculature of the abdominal wall. From this point of view certain abdominal incisions are reviewed.

REFERENCES.

[1] T. Walmsley: "The Costal Musculature", *Journal of Anatomy and Physiology*, Volume I, 1915-1916, page 165.
[2] F. Davies, R. J. Gladstone and E. P. Stibbe: "Anatomy of Intercostal Nerves", *Journal of Anatomy*, Volume LXVI, April, 1932, page 323.
[3] F. Kiss and H. C. Ballon: "Contribution to Nerve Supply of Diaphragm", *Anatomical Record*, Volume XLI, February 25, 1929, page 285.
[4] W. Felix: *"Anatomische, experimentelle und klinische Untersuchungen über den Phrenicus und über die Zwerchfellinnervation"*, *Deutsche Zeitschrift für Chirurgie*, Volume CLXXI, 1922, page 283.

PRE-OPERATIVE TREATMENT OF BILIARY OBSTRUCTION.

By R. Douglas Wright,

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Cases of biliary obstruction of long standing present grave operative risks. In any attempt to minimize these, abnormal metabolism associated with this condition must be considered. The most outstanding features presented are the incomplete digestion and absorption of fats, together with the loss of the bile salts excreted in the urine. The bile salts, being normally circulated between the liver and the bowel, the break in this cycle by urinary excretion is a most serious drainage of a substance which is not usually produced in any considerable amount.

The absence of the direct adjuvant action of the bile on the pancreatic lipase and failure of emulsification of the fat very much reduce the digestion to fatty acid and glycerine. The fatty acid formed is very poorly absorbed in the absence of bile. The patient is starved of fatty acid. This may be made up to a certain extent by the conversion of carbohydrate and amino acids to fatty acid. This change is difficult to demonstrate in biological experiment,[1] and, as may be seen from the low blood lipoid content in the case reported, is not effective in correcting the metabolism of biliary obstruction.

Compensatory phenomena therefore do not correct the fat metabolism, the normality of which is of great importance in the administration of general anæsthetics.[2] The correction must therefore be made by a system of substitution therapy, the administration of fat and bile in a form which will be liberated in the presence of pancreatic juice and in a quantity sufficient to have a therapeutic effect. The first requisite is obtained by coating the bile with salol (its bitter taste and irritant action on the stomach preclude its being given otherwise). The normally secreted 30 grammes (500 grains) of bile solids per day is too much to give conveniently. Forty-eight pills of 0·3 gramme (five grains) each were given per day with meals to the patient whose report is appended. The diet was carbohydrate 150 grammes, fat 100 grammes and protein 70 grammes. A very definite improvement in fat absorption and metabolism at once became manifest.

CASE REPORT.

A. G., a female, aged forty-two years, was admitted to Melbourne Hospital on April 24, 1930, and discharged on June 7, 1930.

Her husband was alive and well. She had had two premature children which died at birth. No other pregnancies had occurred. She had had no previous illness.

In February, 1928, the patient underwent cholecystectomy for flatulent dyspepsia. The wound drained bile profusely for five months. During this time the fæces were clay coloured, there was nausea, especially with fats, and weight was lost. The wound closed and the patient became deeply jaundiced with bilinuria. The symptoms of intestinal disorder continued.

In December, 1928, operation for repair of the common duct was commenced, but the patient collapsed under the anæsthetic and the operation was abandoned.

In January, 1929, the abdomen was opened and the stump of the bile duct was drained. Bile drained profusely, and this relieved the patient's jaundice, but not her intestinal disorder. Drainage continued until November of that year, when the wound closed and jaundice and bilinuria recurred. The weight of the patient had progressively decreased. She had one or two slight rigors. The loss of blood at the menses was excessive and prolonged in the jaundiced intervals. Sleep had been fairly good. At this period she was admitted to the Melbourne Hospital.

Examination revealed a wasted, but not emaciated, jaundiced, middle-aged woman. Her temperature was 37° C. (98·6° F.), her pulse rate was 100 and her respirations numbered 20 in the minute. Her systolic blood pressure was 110 and her diastolic pressure 82 millimetres of mercury. The specific gravity of the urine was 1·035. It was acid, and contained neither albumin nor sugar; bile salts and pigment were present. (Unfortunately, no quantitative estimation for bile salts is possible.)

Fæces were copious and contained large amounts of unsaponified fat and fatty acid crystals; no starch granules or muscle fibres were seen. The viscera to physical examination were normal, except the liver, which extended two fingers' breadth below the costal margin.

The fæces indicated a competent pancreas, but loss of almost all the fat in the food. The patient was therefore given a high fat diet of fat 110 grammes, carbohydrate 150 grammes and protein 70 grammes for three days. The fæces on the third day were very copious (one kilogram) and contained 33% fat and fatty acid. The fasting blood fat on the fourth morning was 0·36% in contrast with the normal of about 1·6% (extraction method).

On this day she was given sixteen pills with each meal. Fæces from lunch time of this day for twenty-four hours were reduced 40% from that of the pervious twenty-four hours and their fat content was reduced from 33% to 20%. The loss of fat in the fæces had therefore decreased 60% altogether. Her fasting blood fat next morning was 1·3%, an increase of 1% and closely approaching normal. Her general feeling of bodily comfort was reflected in her words: "I feel good. I feel as though I have had a good meal and I have not felt that way since the first operation."

She was given glucose by mouth and 5 cubic centimetres of a 10% solution of calcium chloride intravenously on the day preceding operation and on the morning of operation, when she still felt much improved.

At operation by Mr. Alan Newton (ethylene and oxygen anæsthesia), a dense mass of scar tissue was found binding the first part of the duodenum to the *porta hepatis*. This was resected. The stump of the bile duct was found to be six millimetres (one-quarter of an inch) long and on opening it the mucosa was found to be rough and brown. A rubber tube was sutured into it. The duodenum was then sutured to the dorsal side of it and then opened. The anastomosis was completed by suturing the duodenum to the duct in its entire circumference by Lembert's sutures. The rubber tube was left in position. A small drain tube was inserted, but drained only a slight amount of serous fluid. The wound healed by first intention, and the patient made an uninterrupted recovery, being discharged a month later with much reduction of the icterus and no intestinal disorder.

In a case of calculous obstruction on which this method was tried, the nausea and copiousness of defæcation were much reduced, but no accurate biochemical estimations were made.   The patient's general somæsthetic sensation was much improved.

Pre-operative therapeusis of cases of biliary obstruction of some standing by giving adequate quantities of bile with a fairly large amount of fat in the diet is very definitely of value in restoring the fat metabolism of the patient to normal.   The anæsthetic risk is correspondingly improved.   It cannot replace the use of glucose and calcium chloride or transfusion, but must be adjuvant to them.   The stimulant action of bile salts on the liver observed by Pfaff and Balch,[3] and Joslin,[4] may be of value in preventing liver failure in cases of "white bile".   It is worthy of note that though these investigators were experimenting on cases of biliary fistula with the object of finding a "cholagogue", they noted a marked improvement in the patient's general condition and absorption of all food constituents.

SUMMARY.

1.   Reasons for a method of pre-operative treatment of complete biliary obstruction are given.

2.   The administration of 4·8 grammes (80 grains) of bile coated with salol, at each meal, wherein a high proportion of fat is included, is suggested.

3.   The result of this in one instance was a rise in blood fat and a fall in the fæcal fat and a general improvement in the patient's condition.

4.   A suggestion is made that this form of therapeusis may be of use in cases of calculous obstruction as well as in cases of jaundice due to injury to the common duct.   It is, however, realized that it will not replace other methods, but must be adjuvant to them.

5.   It demonstrates that there is a fruitful field for research in regard to the metabolism in biliary obstruction, for example, as to the effect of bile administration on the blood calcium, the carbohydrate metabolism in the case of a damaged liver, the urinary output of bile salts and pigment.   An attempt is being made to elucidate these and other problems.

ACKNOWLEDGEMENTS.

REFERENCES.

[1] David Rapport: "Interconversion of the Major Foodstuffs", *Physiological Reviews*, July, 1930, Volume X, page 349.

[2] V. E. Henderson: "The Present Status of the Theories of Narcosis", *ibidem*, April, 1930, Volume X, page 171.

[3] F. Pfaff and A. W. Balch: "An Experimental Investigation of Some of the Conditions Influencing the Secretion and Composition of Human Bile", *Journal of Experimental Medicine*, 1897, Volume II, page 49.

[4] E. P. Joslin: "The Influence of Bile on Metabolism", *Journal of Experimental Medicine*, March, 1901, Volume V, page 513.

Short Papers on Diagnosis from the Surgical Clinic of the Alfred Hospital.

SOME DIAGNOSTIC POINTS IN DISEASES OF THE BREAST.

By A. J. Trinca.

I propose to discuss certain points of interest in the diagnosis of pathological conditions in the female breast.

Adhesion to the Skin.

Adhesion to the skin has been described as the infallible sign of cancer of the breast, and with very few exceptions this is true. There
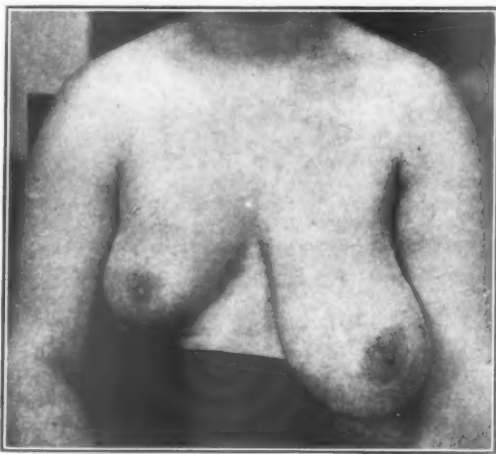
Figure I.   Unilateral macromastia in a girl, aged twenty-one, due to a soft adenoma.

are two conditions, however, which are innocent and yet give this sign. These are traumatic fat necrosis and chronic abscess of the breast.

I shall illustrate my remarks by showing a case of traumatic fat necrosis.

The patient was a woman of sixty-two years, who ten weeks previously had fallen and received a severe blow on the breast. A large hæmatoma developed,

and then as this began to subside a hard lump about 6·25 centimetres (two and
a half inches) in diameter appeared in the bruised area. This showed signs of
skin infiltration and was hard and irregular, having all the local characteristics
of a scirrhous carcinoma.

After the bruising had disappeared and the hæmatoma had absorbed, I
showed the patient to some of my colleagues; all of them diagnosed typical
scirrhous carcinoma.

The mass gradually lessened in size, and now was almost impalpable, but
still showed signs of skin adhesion.

A practitioner seeing the breast now for the first time and not
knowing the history, would make the diagnosis of atrophic scirrhous
carcinoma.

FIGURE II.   Microphotograph of soft adenoma.

Chronic abscess of the breast is often very difficult to diagnose, but
the long history without apparent change in the mass, and the presence
of tenderness in many cases, are diagnostic.

TUBERCULOSIS OF THE BREAST.

Tuberculosis of the breast is rare; the following case history illus-
trates the difficulty in diagnosis.

A girl, aged twenty-eight years, three and a half years ago presented herself
for examination with a crescentic mass about 2·5 centimetres (one inch) wide,
occupying the whole of the lower margin of the right breast. It followed closely
the line of the sixth rib. An X ray examination failed to reveal any evidence
of disease of the rib.

At operation the mass was found to be adherent to the sixth rib, which was
superficially eroded. It was excised with the overlying skin intact and the rib

was scraped. Microscopic examination revealed tuberculosis, but the origin of the condition, whether rib or breast tissue, was debatable.

She remained well until six weeks ago, when three tender masses developed in the lower half of the breast, and quickly coalesced and softened. A cold abscess

FIGURE III. Same case as in Figure I
after operation.

FIGURE IV. Unilateral macromastia in a girl,
aged nineteen, due to abnormal hyperplasia.

containing tubercle bacilli was aspirated at weekly intervals, and the cavity was injected with iodoform and glycerine. The condition now is almost better. An X ray examination of the underlying ribs again fails to reveal evidence of disease.

UNILATERAL MACROMASTIA.

The accompanying illustrations are photographs of the breasts of young women who gave histories of unilateral enlargement of the breast appearing soon after puberty. In all three, clinical examination suggested that the enlargement was more in the nature of a simple enlargement than a pathological condition, the breast tissue feeling perfectly normal to the palpating fingers, and the breast being comparable in shape to the other breast. In only one was the breast tissue normal.

In the first case (see Figure I) there was enlargement due to a large soft fibro-adenoma (see Figure II), which was easily enucleable, and was situated in front of the normal breast tissue. After operation (see

FIGURE V.   Medullary carcinoma found in an apparently simple cyst.

Figure III) the remaining breast tissue had expanded, and there was now no appreciable deformity.

The second case on microscopic examination showed abnormal hyperplasia (see Figure IV).

As a contrast I show a lantern slide of another form of unilateral hyperplasia in the shape of Brodie's serocystic disease. Here the diagnosis of pathology in the breast is obvious from the abnormal consistency of the breast and the heaviness and deformity.

CARCINOMA SIMULATING INNOCENCY.

Carcinoma may have all the characteristics of an innocent tumour.

Some weeks ago I had made the diagnosis of a simple cyst of the breast, there being present in the breast of a woman, aged forty-five years, a deep seated fluctuant spherical tumour about the size of a golf ball.

At operation a thick walled cyst was excised intact by a marginal incision in a wedge of surrounding breast tissue. I was struck by the white appearance of the wall of the cyst in contrast to the usual blue domed variety met with, and examined it on the spot. I was surprised to find that it was filled with soft growth. Microscopic examination (see Figure V) revealed medullary carcinoma.

I show another slide illustrating this point.

This a slow growing tumour in a woman, aged sixty years, which completely filled the breast, was freely movable on the chest wall, and showed no signs of skin involvement, and no evidence of axillary gland involvement (see Figure VI).

FIGURE VI. Completely encapsuled non-infiltrating columnar carcinoma of the breast, clinically resembling adenoma.

A small attrition ulcer had occurred and the base of this revealed the thick capsule of the underlying tumour. A diagnosis of adenoma was made, and the breast was removed after immediate microscopic section had shown that the growth was a columnar carcinoma undergoing mucoid change. The immediate microscopic examination was made solely on account of the woman's age, innocent tumours in women of this age being very rare.

SACRO-ILIAC JOINT DISEASE.

By JOHN KENNEDY.

IT is with feelings of humility and some diffidence that I present before this meeting the subject of sacro-iliac disease.

Matters which have to me appeared difficult, and which give food for a great deal of thought, are probably simple and clear to many of you; but it is because of the difficulties that I have met in dealing with these cases, that I have selected them to present to you.

The cases illustrate the difficulties in the diagnosis of chronic sacro-iliac disease; but before presenting them I should like to review the main symptoms and signs of the condition.

SYMPTOMS.

Two main symptoms usually present are pain and weakness.

Pain.—Two types of pain may be present: (*a*) Local pain (in the joint) is rare and is overshadowed by the other type of pain in the chronic case, thus contrasting with its predominance in the acute case. (*b*) Referred pain, on the other hand, is the common outstanding symptom. It is manifested in some area of distribution of the sciatic nerve, for example, foot, calf or thigh, and occasionally ankle, knee or hip.

Weakness.—There is an inability to lift weights; the patient has difficulty in climbing stairs, in going down stairs, and in stepping off a pavement.

SIGNS.

The clinical signs presented may be divided into groups:

1. Local evidence of disease; swelling or tenderness over the joint.

2. Signs manifested by some interference with the supporting function of the joint. The patient must be examined standing, walking, sitting and lying down. When he is standing, the weight is carried on the unaffected leg, with the body bent to that side. Flexion forwards is often painless in the early stage of that movement, but becomes painful as it progresses and is limited in range; the patient often places his hands on the part in an endeavour to control the pain. When he is in the sitting position, with relaxed hamstrings, flexion is generally good; and when the patient is lying down there may be no limitation to the degree of active and passive flexion of the spine, provided the hamstrings are relaxed. In walking there is a degree of lameness, and the foot is placed carefully down to avoid jarring the back.

3. Signs elicited by various movements which put stress or strain on the joint, causing pain: (i) the Kernig sign, with Goldthwaite's application, (ii) Gaenslen's sign, (iii) those elicited by direct manipulation of the pelvis itself.

The Kernig sign (flexion of the thigh with the straight leg) is usually well marked in the contralateral limb. Goldthwaite uses this sign by flexing both limbs with one hand, the other being under the patient over the lumbo-sacral joint. He states that the hand under the patient can feel the lumbo-sacral joint move as flexion of the limb takes place; pain before this is due to sacro-iliac disease, but if the occurrence of pain is delayed until this joint moves, it indicates lumbo-sacral disease. I find difficulty in separating movements of these joints, and of obtaining definite data by this sign.

Gaenslen's sign, produced by acute flexion of the contralateral thigh (fixing the pelvis and lumbar spine) and hyperextension of the thigh on the same side, with the patient at the edge of the examination couch, is a very definite way of throwing strain on the sacro-iliac joint, and will give definite evidence of disease if a lesion is present.

Manipulation of the pelvis. (i) Simple compression and expression of the ilia, by compressing and expressing the bone in the region of the anterior superior iliac spines. This is easy in thin subjects, but in the stout and powerfully built it is difficult and not always reliable. (ii) To separate sacro-iliac disease from lumbo-sacral the following method is useful: Place the patient on the unaffected side, one hand grasping the iliac crest near the anterior superior spine, the other hand exercising counter-pressure on the sacrum for sacro-iliac disease and on the fourth and fifth lumbar spines for lumbo-sacral disease. Expression or compression of the ilium rarely fails to give rise to pain in disease of these joints.

ILLUSTRATIVE CASES.

The cases presented are: Case I, acute sacro-iliac disease, with abscess formation; the symptoms and signs were local and characteristic from the onset. Case II, a chronic case.

CASE I.—The patient is a hospital sister. I present her history notes and skiagrams. The main points in the history are: The patient had a fall on the hip in the ward, with local bruising and pain. Some weeks later pain came on in the thigh, calf and foot, thought to be due to sciatica; the pain persisted, and steadily increased in severity. She remained on duty and treated herself. Three months later she was referred to a visiting surgeon at the hospital, when stretching and saline solution injections were carried out, without improvement.

Six months after the onset of the sciatica, careful investigation revealed tenderness in the sacro-iliac joint; positive Kernig and pelvic signs were present. X ray examination revealed rarefaction of the sacrum and ilium, blurring of the whole joint line, and a very definite area of destruction of bone.

She was a well developed, well nourished woman, forty-five years of age, and it was difficult to be certain that the condition was one of tuberculosis. The diagnosis was later confirmed at operation.

CASE II.—A male patient, aged thirty-nine years, was treated for two years for what was thought to be chronic rheumatism of the right ankle and later of the

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knee and hip joints. Six months ago his left wrist became involved, and later some doubtful swelling of the left testis occurred.   Seven days ago he developed a swelling over the right sacro-iliac joint of the cold abscess type; at no time has there been reference to pain in the region of this joint; moreover, there is no evidence of disease in the ankle, knee or hip joints, and Kernig's, Gaenslen's and pelvic signs are not elicited.

X ray examination reveals evidence of disease in the sacro-iliac joint; there are rounded areas of destruction of bone, surrounded by areas of sclerosis suggesting gummatous type of destruction.   (The Wassermann test is negative.) Sclerosis and obliteration of the joint line suggest ankylosis of the joint.

The wrist joint is tuberculous, but of an uncommon type, the condition being apparently limited to the radio-carpal joint, and showing extensive new bone formation in the lower third of the radius.

There is an enlarged left epididymis, with a simple hydrocele; no tubercle bacilli were found in the fluid—a guinea-pig is quite well four weeks after inoculation.   (The guinea-pig died later, and positive evidence of tuberculosis was found in the cold abscess of the sacro-iliac joint.)

Both cases illustrate the difficulties in diagnosis of chronic disease of the sacro-iliac joints.

In the early stage the absence of local manifestations, the normal or indefinite X ray pictures, and the dominating sciatic nerve pain, which may be due to many causes, present a problem which, though difficult, should always be elucidated by a carefully conducted clinical examination.

POINTS IN THE DIAGNOSIS OF INTRACRANIAL TUMOURS IN CHILDHOOD.

By H. C. COLVILLE.

CUSHING has stated that the modern neuro-surgeon should be capable of making an accurate pre-operative diagnosis, of carrying out the operative treatment, and of estimating the pathological potentialities of the lesion found in all cases of intracranial tumours. Although very few surgeons have, like Cushing, sufficient material available to enable them to obtain this ideal, there are several fairly simple diagnostic procedures which can be carried out by any surgeon, and which will often serve to locate an intracranial tumour without the assistance of specialized neurological knowledge.

These procedures are all based on the idea of demonstrating a disturbance of the physical and mechanical conditions of the intracranial contents, including the cerebro-spinal fluid, rather than a disturbance of the finer shades of function of some particular part of the central nervous system.

Some of these diagnostic methods may be briefly enumerated.

INVESTIGATION OF THE CLINICAL HISTORY.

The classical triad—headache, vomiting and papilloedema—are usually all present at some stage in the disease, although not necessarily at all stages, nor simultaneously. Papilloedema may be the first sign, resulting in the patient being first seen by the ophthalmologist. When once established, papilloedema progressively increases and will ultimately go on to optic atrophy. Headache and vomiting are also apt to be early symptoms, but may abate or disappear in the later stages as the brain becomes used to the irritation set up by the tumour. From the history of the past or present existence of these three classical symptoms it will usually be possible to deduce the existence of a neoplasm somewhere within the cranium.

RADIOLOGICAL INVESTIGATION.

Radiological investigation may provide the most valuable information in the following ways:

1. The long continued presence of increased intracranial tension produces well marked changes in the plastic skull of childhood, which can be readily detected in the X ray film. There will be widening and separation of the various sutures, widening and deepening of the *sella turcica* with distortion of the adjacent clinoid processes, and increase in

diameter of the internal auditory meatus. These changes are of course relative and will vary with the duration of the disease and the age of the patient, being more marked the younger the child.

2. Small areas of calcification may occur in certain tumours, and these may be easily seen and localized by a stereoscopic X ray film.

3. Radiography after filling of the ventricular system with air or oxygen (ventriculography) may reveal: (*a*) a general dilatation, indicating internal hydrocephalus; (*b*) persistent failure of the gas to enter some part of ventricular system (this is particularly liable to occur with the fourth ventricle in cases of subtentorial tumours); (*c*) persistent distortion in one region due to the encroachment on the ventricle of an adjacent tumour.

INVESTIGATION OF THE CEREBRO-SPINAL FLUID.

Investigation of the cerebro-spinal fluid may be of great value in distinguishing between supratentorial and subtentorial tumours. The latter usually produce some degree of obstruction to the outlet of cerebro-spinal fluid from the ventricular system into the subarachnoid space, and this obstruction may be demonstrated as follows: (*a*) The fluid obtained by ventricular puncture will differ both in pressure, as measured by a suitable manometer, and in protein content from that obtained by lumbar puncture. (*b*) If a dye, such as indigo-carmine, be injected into one lateral ventricle, it should appear in the fluid obtained by lumbar puncture in a normal case in one-quarter to one-half an hour; in an obstructed case it may be much delayed or not appear at all. Great care should be exercised in carrying out such tests, which involve lumbar puncture, to avoid any sudden lowering of pressure in the subarachnoid space. This may result in a forcing down of the contents of the posterior cranial fossa into the *foramen magnum* by the greatly increased intracranial tension, and consequent pressure on the medulla which may have alarming or even fatal results.

ILLUSTRATIVE CASES.

The following two cases, in each of which correct localization of an intracranial tumour led to successful surgical intervention, illustrate some of the foregoing diagnostic methods.

G.R., a female, aged eleven years, was first seen in January, 1930. For two and a half years she had suffered from epileptiform fits which appeared to commence on the left side of the body; for the last six months there had been headache, vomiting, failure of vision, and some wasting and loss of power in the left arm and hand. Both eyes showed papillœdema of about two diopters. Ventriculography revealed distortion and filling defect of the right lateral ventricle. Stereoscopic X ray films showed several small calcified nodules in the subcortical region beneath the right Rolandic area. At operation an encapsulated tumour about the size of a small hen's egg was found in this situation. It was completely removed after having its centre scooped out with the diathermy loop as described by Cushing. Its deep surface was found to project into the lateral ventricle, which was freely laid open during the operation. Several small calcified nodules were

found in the substance of the tumour after removal.   This child made an uneventful recovery, and is now quite well nearly three years after operation.

J.S., a male, aged twelve years, was first seen in Septemebr, 1932.   Fifteen months previously he commenced to have attacks of headache and vomiting which had persisted for about nine to twelve months, and then ceased completely. From then on there was steady failure of vision.   At the time of examination there was marked double papillœdema, with early atrophy of the right disk, but neurological examination revealed no abnormality.   Skiagrams of the skull showed widening of the suture lines and enlargement of the *sella turcica* and internal auditory meatus.   Ventriculography revealed a general dilatation of the ventricle, and absence of filling of the fourth ventricle.   The fluid obtained by ventricular puncture was under a pressure of 30 centimetres (normal eight to ten centimetres) and contained 0·02% protein. The fluid obtained by lumbar puncture had insufficient pressure to register in the manometer, and contained 0·55% protein. Indigo-carmine injected into the ventricle had not appeared in the spinal fluid two hours later.

From these data the presence of a tumour in the posterior cranial fossa was confidently assumed.   At operation a huge astrocytoma was found occupying the whole of the left lobe of the cerebellum.   Its lower pole was firmly "corked" into the *foramen magnum*, necessitating laminectomy of the atlas before it could be delivered.   About one-half of the tumour had been removed piecemeal with the diathermy loop when the child's condition was so poor that the operation had to be abandoned.

He made an uneventful recovery, and is now being kept under observation pending a future attack on the remaining portion of the tumour.

INSTRUCTIVE ERRORS IN DIAGNOSIS.

By Balcombe Quick.

Instructive errors in diagnosis are shown in the cases herein reported.

1. A man of forty years was admitted on February 24, 1932, into a medical ward with the history that six weeks earlier there had been an onset of abdominal pain and jaundice with fever and vomiting. The symptoms had subsided considerably before admission.

Examination revealed a tall sallow man still showing slight jaundice; tenderness was present across the whole epigastrium and a mass was to be felt in the left hypochondrium. This mass had a definite respiratory excursion, was rounded and showed no notching. There was slightly diminished vesicular murmur at the left base. The urine contained no bile. The Graham Cole test revealed a somewhat poor concentration of bile and the emptying time was prolonged. X ray examination disclosed an hydatid cyst 3·75 centimetres (one and a half inches) in diameter deep in the right lung. The result of the Casoni test was positive. There was some complaint of pain in the left loin and the patient was unable to lie on that side.

The past history was of almost yearly recurring attacks of left-sided pleurisy since 1917. On one occasion only was the right side said to have been involved. It had been noted in 1927 that there was a degree of anæmia present. On a number of occasions the patient had been yellow, and he had been told during one severe attack that bile was present in the urine.

The diagnosis of hydatid of left lobe of liver was made, and it was thought that a mild degree of infection in the cyst was present.

The patient was not examined again until he was on the operating table some three weeks later. It was then evident that the icteric tint of the skin had lessened and that the mass in the left hypochondrium was definitely smaller. A mental note was made that the infective process had quietened down.

When the abdomen was opened the liver was found to be normal, but the spleen enlarged to about four times its normal size. Packs were placed in the incision whilst a leucocyte count (11,000) and a corpuscle fragility test were made. Hæmolysis was found to occur with 0·5% saline solution. Splenectomy presented no difficulties. The spleen on removal weighed 509·4 grammes (eighteen ounces), and showed the usual picture of hæmolytic icterus—large blood spaces containing degenerate red cells and many dark pigment granules. After operation the patient's colour improved rapidly, though the gain in strength was slow.

Apart from the error in diagnosis associated with a dual pathology, this case is of interest as an example of the fact that on occasions, as pointed out by Lord Moynihan, bile may be found in the urine in cases of so-called acholuric jaundice.

2. A man, aged sixty-two years, of fair colour and nutrition, admitted to hospital on March 3, 1932, gave a history of feeling generally off colour, of some upper abdominal pain and of increased frequency of micturition with some scalding. In 1916 he had been treated for "nephritis", when both blood and pus were present in the urine.

On examination the scars of three left-sided incisions were visible, one paramedian, another in the iliac region and a third in the left loin extending forwards above the iliac crest. They were all made, he said, in 1923, "when he had an abscess of the kidney operated upon".

There was complaint also of pain and swelling about the lumbar incision, where a rather large lumbar hernia was evident. On bimanual examination a mass was felt to descend from beneath the last rib. This mass was free from tenderness. Another fixed mass, tender to palpation, was present in the left iliac fossa at the level of the anterior superior spine. Urinary examination revealed a specific gravity of 1·008, acidity, a trace of albumin, and an occasional epithelial cell.

X ray examination showed the outline of the right kidney plainly, but that of the left was "obscured on account of increased density in the region of the left lobe of the liver and gas in the colon".

On cystoscopy the bladder was normal in appearance, the right ureter was catheterized, but no catheter could be passed more than about 7·5 centimetres (three inches) up the left ureter. Good excretion of indigo-carmine occurred in twelve minutes from the right side; none escaped from the left. The pyelogram of the right kidney was substantially normal. Retrograde pyelograms ("Abrodil") were reported upon as valueless on account of respiratory movements.

The blood urea was estimated to be 52 milligrammes for 100 cubic centimetres, and the urea concentration as 1·9% (70 cubic centimetres) and 2·2% (85 cubic centimetres). The diagnosis of periureteric inflammatory mass, with stricturing and closed pyonephrosis, was made.

Exploration in the left loin was attended with much difficulty owing to scar tissue and herniation of the descending colon. When finally the tumour was delivered after division of the twelfth rib, it was found to be the spleen. The operation was terminated by packing to check oozing from its surface and closure of the wound.

A fortnight later the abdomen was opened through the old left paramedian incision, and after careful packing off the retroperitoneal mass in the left iliac fossa was explored. It was found to consist of fibrous tissue containing gritty particles and giving off a urinous smell. It was an ectopic, iliac kidney. A drainage tube and iodoform gauze pack were inserted and the wound was closed.

A very small amount of discharge persisted for some two months before healing finally occurred. A note after three months speaks of gaining weight each week.

The error made might have been avoided if due weight had been given to the fact that the loin mass was free from tenderness.

3. A man, aged sixty-eight years, was admitted to hospital on August 19, 1932, with the history of being "off colour" for four months, jaundiced for eight weeks and of attacks of pain in the right hypochondrium for six weeks.

The onset of jaundice followed shortly after an acute attack of abdominal distension. There had been much flatulence and the stools became clay coloured. He improved a good deal, but two weeks later there was a sudden attack of pain in the right hypochondrium and epigastrium, which on one occasion only radiated around the right side to the back. These attacks had always recurred following the taking of food, and had disappeared as suddenly as they came. There had never been any vomiting or nausea, but much flatulence.

The jaundice had fluctuated in intensity, but was always deeper after the attacks of pain. He had lost 15·7 kilograms (two and a half stone) since the onset, in part due, no doubt, to his unwillingness to eat lest the pain should recur.

The past history was of an abdominal exploration ten years before. The liver was then found to be enlarged and presented numerous areas which were

looked upon as secondary deposits of carcinoma and the abdomen was closed. His response to the Wassermann test was a "partial" reaction at that time and several injections of "Novarsenobillon" were given with apparent benefit before his discharge from hospital. The health then continued good until four months before admission.

On examination the complexion was icteric and the liver edge could be seen three fingers' breadth below the right costal margin, moving with respiration. It was firm, but neither nodular nor tender, except over the gall-bladder region. The spleen was not palpable. The Wassermann test gave no reaction.

On exploration, the liver was found again to present multiple areas of induration and fibrosis, said by an observer who had been present at the former operation, to resemble those noted ten years before. Indistinct fluctuation was made out in one area and a needle was inserted here with withdrawal of hydatid fluid.

Incision evacuated an enormous hydatid cyst with multiple daughter cysts. A very large drainage tube was inserted and cysts continued to discharge for a month, after which a slow convalescence, interrupted by an attack of acute nephritis, began. The Casoni skin test was found to give no reaction.

The case illustrates the advisability of needle exploration of doubtful liver enlargements.

OBSERVATIONS ON THE FREQUENT OCCURRENCE OF "SILENT" FOCI IN CASES OF SO-CALLED SURGICAL TUBERCULOSIS.

By H. C. TRUMBLE.

OBSERVATIONS extending over many years have served to bring home to me the fact that patients suffering from tuberculosis of bones, joints, and so on, frequently have other lesions, some obvious, some obscure. I have felt that the diagnosis can scarcely be said to be complete until all of the foci have been detected, and this can be achieved only by the most careful and painstaking investigations, clinical, radiological and bacteriological. The importance of establishing a complete diagnosis I need hardly emphasize.

On several occasions I have been unpleasantly surprised to discover lesions in the renal tract in patients under treatment for such troubles as hip disease or Pott's disease. The interesting, but no less disturbing, fact is that many of these patients looked and felt well, and were regarded as progressing favourably under treatment. Further, they often had no symptoms of sufficient importance to direct attention to the renal tract, and yet in some cases there was advanced disease of the kidneys.

I decided that in order to detect such "silent" foci it was necessary to regard them as present in all cases until proved absent, and this entailed investigations repeated at intervals for a year or two. After the primary clinical, radiological and bacteriological examinations are made, I like to repeat the first and last about once a month. The clinical examination must embrace all systems in the body; the bacteriological examination deals mainly with the sputum, if any, and the urine. It is to the examination of the urine that I wish to direct attention here.

Since I have adopted the practice of having the urine examined once a month in all cases of tuberculosis, I have detected bacilli in a considerable percentage of cases. Whenever there is an abnormal number of lymphocytes, it is likely that bacilli will be found either at the same or at a later examination. If they are found repeatedly or occur in clumps, it is likely that there is a definite renal focus. The question of extrusion of bacilli from the blood by the way of the kidneys need not be discussed.

Unless the surgeon realizes that multiple foci are frequently present, that some of these are silent, that tuberculosis of the genito-urinary tract may be practically symptomless for long periods, and that the patient may look and feel well, although harbouring the bacilli in several

lesions; unless, knowing this, the surgeon is constantly on the lookout for obscure, silent foci, he will frequently fail to detect them, and, in consequence, may make serious errors in management.

In illustration of my remarks I quote the following case notes.

A woman, aged twenty-four years, was admitted to hospital under my care in August, 1922. She had been treated for tuberculosis of the right wrist joint at another hospital. There were several sinuses about the wrist. Some time after admission she complained of pains in the back, and a radiogram disclosed a focus in the lumbar part of the spinal column. Later the left knee joint became affected. Tubercle bacilli were found in the sputum in 1925. At no time did the patient look seriously ill. The blood was examined after this, and the Wassermann reaction was found to be strongly positive. Treatment was instituted for syphilis and the patient's condition improved. In 1926 minor symptoms referable to the bladder arose, and tubercle bacilli were found in the urine. The right kidney was removed in August, 1927, and found to be completely destroyed. After this urinary examinations were carried out on eighteen occasions extending over about two years, and no more tubercle bacilli were discovered. The patient was up and about, apparently well. She reported again in September, 1932, not so well, and tubercle bacilli were discovered in the urine. She went rapidly down hill, and died in January, 1933.

There are several points to be noted about this case. First, the diagnosis was so clear, being clinched by the finding of bacilli in the sputum, that syphilis was not considered seriously. The lesson is that all cases of chronic inflammation of joints *et cetera*, should be regarded as being possibly of syphilitic origin, unless proved not to be syphilitic. Secondly, when first seen, the patient did not seem to be seriously ill, yet she probably had, even then, multiple "silent" foci of tuberculosis. Thirdly, the kidneys were involved, probably early in the course of the disease, yet symptoms were never very much to the fore.

Had a Wassermann test been made early and had the urine been examined periodically, a proper diagnosis would have been made long before it actually was made.

I could quote many cases in which the diagnosis has been made late from neglect of routine examinations as outlined above, and many in which such examinations have been rewarded by positive findings. I shall content myself with the relation of the following experience.

I was asked to see in consultation a girl with tuberculosis of the spine. I suggested that the urine should be examined bacteriologically. This was done, and tubercle bacilli were found, and have been found on several occasions since then. There have never been any symptoms pointing to an inflammatory lesion in the renal tract.

A short time afterwards the practitioner in charge of the patient told me that as a result of the experience just quoted, he had had the urine of another patient with Pott's disease examined. To his astonishment bacilli were again discovered.

DIFFICULTIES IN THE DIAGNOSIS OF ACUTE APPENDICITIS.

By C. J. OFFICER BROWN.

ANYONE who has much experience of acute appendicular disease must recognize the fundamental difference so frequently stressed by Wilkie between acute appendicular obstruction, a closed loop obstruction of the appendix, pregnant with the danger of general peritonitis, and true inflammatory appendicitis, somewhat analogous to tonsillitis, which will usually subside without urgent treatment.

Epigastric colic, followed by vomiting, with a dirty tongue and offensive breath, should always suggest appendicular obstruction. If pain and tenderness in the right iliac fossa are also present, the diagnosis should be confidently made. Rise of temperature and increased pulse rate depend on toxic absorption, and, therefore, often occur considerably later than the signs and symptoms due to the mechanical obstruction of the appendix, and their absence need not prejudice the diagnosis.

Pelvic appendicitis and appendicitis in the aged are the two problems that cause most difficulty in diagnosis.

When the appendix is deep in the pelvis, the characteristic localization in the right iliac fossa may not occur, and it is only by close attention to the mode of onset and the march of symptoms and routine rectal examination that a diagnosis can be made.

F.W., aged twenty-one years, was admitted to the Alfred Hospital with a fractured tibia and fibula and a compound fracture of the skull.

Ten days later, while still in hospital, he complained in the evening of sudden severe subumbilical pain. The pain persisted intermittently through the night and his bowels were opened twice, with considerable relief of the pain. He vomited two or three times. At 6 a.m. next morning he collapsed and his blood pressure fell to 85 millimetres of mercury. Seen by me at 9 a.m., he had recovered from his collapse and his blood pressure was 116 millimetres of mercury, his pulse rate was 104 and his temperature 38·3° C. (101° F.).

The pain had practically gone, his tongue was coated and his breath offensive. His abdomen was diffusely tender, with maximum tenderness in the left loin and suprapubically. There was no rigidity. On rectal examination he was tender, but not markedly so.

Another surgeon saw him in consultation with me and we agreed that his condition was probably an acute bowel infection. During the day his bowels were open several times and there was no further vomiting.

At midnight his condition was worse. His pulse rate was 130 and now there was more tenderness in the right iliac fossa, but his greatest tenderness was still in the left loin and up under the costal margin, and there was no rigidity.

At this time he was seen by a third surgeon who considered his condition was due to an acute bowel infection with toxæmia, but no peritonitis.

At 9 a.m. next morning he was very ill, with a pulse rate of 140, a dry dirty tongue, and a very offensive breath. His abdomen was diffusely tender and tumid, and tenderness was most marked in the right iliac fossa.

Operation was performed and a gangrenous perforated pelvic appendix, giving rise to general peritonitis, was found and removed. Recovery was uneventful.

The interest in this case lies in the fact that, although the patient was under close observation in a public hospital and seen by three surgeons of experience in this class of work, alive to the probability of appendicitis, operation was not performed until thirty-six hours after the onset and twenty-seven hours after the rupture of the appendix, as evidenced by the period of collapse with improvement of his pain. The salient features of his history are quite clear, and on these diagnosis and treatment should have been based despite the equivocal history of diarrhœa and the vagueness of the findings on abdominal examination.

His collapse was evidence of an abdominal crisis and next morning a ruptured pelvic appendix should have been confidently diagnosed as the only crisis that would fit his symptoms.

I should like to direct attention to his symptomatic improvement following the collapse, and the only indication that this was apparent and not real was the evidence of a steadily rising pulse rate.

When the case is not seen till peritonitis has occurred and is spreading out of the pelvis *viâ* the left paracolic gutter, the greatest tenderness will be found in the left iliac fossa, and this may further confuse the diagnosis.

Appendicitis in old people may closely mimic the symptoms of subacute intestinal obstruction.

A.O., a male, aged sixty-eight years, four days ago got colicky abdominal pain followed next day by vomiting.

The pain was mainly in the lower part of the abdomen, and was associated with a rumbling feeling. His bowels were open once or twice, but he passed only mucus with some blood. For some time he had noticed increasing constipation with attacks of morning diarrhœa, and he had lost a considerable amount of weight lately.

On examination the patient looked very ill. His tongue was dry and brown, and his breath sour. His temperature was 37·9° C. (100·2° F.) and his pulse rate 76.

His abdomen was distended, especially in the flanks, and was tender all over and slightly rigid, with no localizing tenderness. Rectal examination discovered diffuse tenderness. A diagnosis of carcinoma of the colon with acute obstruction was made.

Caecostomy through a muscle splitting incision was decided on, and on opening the peritoneum free turbid fluid escaped, and a ruptured gangrenous appendix was easily removed and a tube was placed in the pelvis.

The development of inflammatory lesions in old people is slow, and there is much less local reaction than in young people. Appendicitis when it occurs is nearly always obstructive in type, probably because with the atrophy of the lymphoid tissue of the appendix the liability to simple inflammatory lesions ceases.

The initial colic is much less severe than in young people, and there is very little general toxæmia, and vomiting is slight or may be absent.

The patient is often not seen until the third or fourth day, or even later, when an insidious pelvic peritonitis is causing ileus with distension and constipation and, as happened in the case presented, a previous history of increasing constipation and loss of weight may be obtained. Often there is no rise in temperature, and there may be little more than a vague discomfort on palpating the abdomen, and tenderness, if it is marked, is sometimes chiefly located in the left iliac fossa. Rigidity is not present. Examination with a stethoscope may find a silent abdomen, but at an earlier phase intestinal rumblings will be present and sometimes a suggestion of a ladder pattern may be observed, but visible peristalsis is not seen.

If appendicitis is thought of as an alternative diagnosis, the mistake can usually be avoided.

Any elevation of temperature is in favour of appendicitis, vomiting is less than would be expected with an obstruction sufficiently advanced to give rise to tenderness and tumidity of the lower part of the abdomen and the tenderness on rectal examination. Constipation is often not absolute. Free fluid in the abdomen is in favour of peritonitis. Since the alternative diagnosis is nearly always obstruction by a growth, best treated by caecostomy under local anæsthesia in these sick patients, error of diagnosis is not of vital importance provided surgical relief is not delayed. Immediate operation is always essential in these cases.

X ray examination of the abdomen on a plain film is frequently of great value in excluding or localizing organic obstruction, and can be done with very little disturbance to a sick patient when a barium enema would not be justified.

Other diagnostic difficulties I have met with are shown in the following list: (i) strangulation of the lower part of the ileum, (ii) tuberculous peritonitis, (iii) ruptured ectopic gestation, (iv) streptococcal typhlitis and peritonitis, (v) perforated duodenal ulcer, (vi) twisted ovarian cyst, (vii) salpingitis, (viii) ruptured ovarian chocolate cyst, (ix) ruptured Graafian follicle, (x) ileo-caecal adenitis, (xi) urinary conditions, (xii) acute cholecystitis.

In two cases I have diagnosed appendicular obstruction and at operation have found a strangulation of the lower part of the ileum, once by a band and once through a hole in the mesentery.

In both cases mid-gut colic, followed by vomiting, with localization in the right iliac fossa, and a dirty tongue and foul breath and slight rise in temperature and pulse rate, made the diagnosis of appendicitis inevitable. The first patient was not very ill, and division of the band was followed by prompt recovery. The second patient, operated on six hours after the onset of pain, had gangrene of the last twenty centimetres (eight inches) of the ileum. Resection followed some weeks later by anastomosis of the ileum to the caecum was followed by recovery.

M.Y., aged nineteen years, had had vague pains in her abdomen for two months and had noticed her abdomen swelling. Thirty-six hours before admission to hospital she got severe pain around the umbilicus and vomited shortly afterwards. The pain eased somewhat and later settled in the right iliac fossa. Her bowels were not opened. Micturition and menses were normal.

On examination, her temperature was 39·4° C. (103° F.), her pulse rate 130 and respirations 34. She looked very ill, and her tongue was furred and her breath offensive. Her abdomen was unusually large for her build and obvious free fluid was present. Considerable tenderness was present in the right iliac fossa and the muscles in this area were on guard. Rectal examination and examination of the urine revealed no abnormality.

Operation disclosed tuberculous peritonitis with ascites, and the appendix, studded with tubercles, was removed. The gradual swelling of her abdomen and the presence of a large amount of free fluid should have suggested the true state of affairs. Operation relieved her condition and the fluid did not recur.

Time does not permit a detailed consideration of the other "difficulties" on my list, but it should be noticed that in most of them the typical onset of appendicular obstruction with mid-gut colic is absent.

Five of the remaining ten conditions are associated with the female genitalia and a carefully elicited history, examination for vaginal discharge or bleeding and bimanual examination of the pelvis should enable a diagnosis to be made.

The importance of microscopic examination of the urine in doubtful cases cannot be too much stressed, and in looking for red blood cells in cases of suspected calculus it is obvious that a non-catheter specimen should be examined.

When a patient is seen for the first time with general peritonitis and a rigid abdomen, it may be difficult to distinguish between appendicitis and a perforated duodenal ulcer. A clean cut past history of duodenal ulcer may help, but appendiceal dyspepsia may cause confusion. Vomiting is more marked with appendicitis. If doubt remains, a small exploratory epigastric incision will settle the diagnosis and if no perforation is found the appendix can be most rapidly removed through McBurney's incision, the tedious closure of a long paramedian incision being thus avoided.

Perforated ulcer is the more urgent of the two conditions and should therefore be approached first.

THE DIAGNOSIS OF DEPRESSED FRACTURE OF THE MALAR BONE.

By Fay Maclure.

FRACTURE of the malar bone is not uncommon, but it is frequently unrecognized because the deformity is masked by the overlying swelling of the soft tissues, and it is not until this swelling has subsided that the displacement becomes evident at a time when it is too late to remedy the disfigurement.

This disfigurement, an asymmetry of the face, is more apparent in that particular type of face in which the cheek bones are prominent, and it may be so noticeable as to be a constant source of unhappiness and annoyance to the patient. It is, therefore, important that the lesion should be suspected in every facial injury, and steps taken to recognize and to repair displacement. It is possible, although difficult, to demonstrate the fracture by means of X rays, but it is easy to diagnose the condition by a set of signs and symptoms which are fairly constant.

The lesion is really not a fracture of the malar bone itself; it affects rather the structures upon which the malar is supported, the thin flat portions of the superior maxilla forming the walls of the antero-lateral portion of the large air sinus, the antrum, which are readily broken and indriven, and in which there is no tendency to spontaneous reposition. The fracture thus involves the floor of the orbit, which is depressed, the infraorbital canal, the anterior wall of the antrum and the zygomatic arch.

The diagnostic points are:

(1) Swelling and bruising over the prominence of the cheek which conceals the underlying deformity.

(2) Diplopia, the result of lowering of the orbital floor and consequent alteration in the relationships of the orbital structures or the eye itself. The diplopia is temporary, lasting from an hour or so to two days, when the muscles adjust themselves to altered conditions and single vision is restored.

(3) Bleeding into the superficial structures, into the orbit, into the antrum and appearing in the nose. The effusion of blood in the antrum renders this air cell opaque to transillumination and to skiagraphy.

(4) Anæsthesia. The fracture generally includes or encroaches on the infraorbital notch, foramen and canal. Consequently there is damage to the infraorbital nerve. Structures supplied by this nerve show alteration in sensation; generally an anæsthesia of the infraorbital portion of the cheek, side of the nose, half the upper lip, and six anterior

teeth on the side of the lesion. It is best demonstrated by clicking the teeth together when the patient complains that he is unable to feel the anterior teeth on that side.

(5) The bony lesion. (*a*) As the bony lesion results in depression of the orbital floor and as the fracture usually takes place through the infraorbital notch or canal, there is a step-down displacement of the orbital ridge at this point which is best demonstrated by running the finger nail along the ridge from the inner angle of the orbit outwards. (*b*) As the malar bone is depressed, and as it forms the anterior portion of the zygomatic arch or bow, this structure, the bony bow, is bent outwards and fractures at a point behind its middle. This gives rise to a tender swelling on the zygomatic arch. This diagnostic sign of tenderness remote from the site of injury is very significant of depression of the malar bone. (*c*) Depression of the malar bone itself is best demonstrated by standing behind and above the patient, and observing the contour of his forehead and face. When the pulp of each index finger is placed on the corresponding malar bone, the relationship of the posterior surface of the index to the levels of the forehead makes the bony depression on the affected side quite obvious.

Surgical Technique.

TREATMENT OF HYPOSPADIAS.

By R. B. WADE,
Sydney.

THE accompanying diagrams are taken from those appearing in the *"Précis Clinique et Opératoire de Chirurgie Infantile"*, by L. Ombredanne.

Diagram 1 shows the line of incision in the operation for cure of a penile hypospadias. A sac is dissected up from below and from the sides as far as the line of the incision *A* up to the faintly dotted line *B*, which represents the dorsal portion of the unclosed urethra. A purse-string suture is then placed, as shown, in the coarsely dotted line *C* up to the top of the glans. This suture is then tightened around a
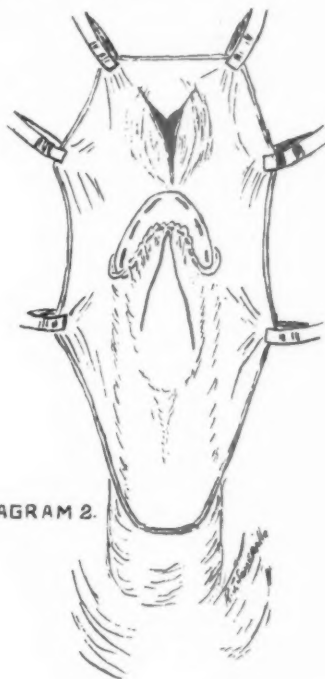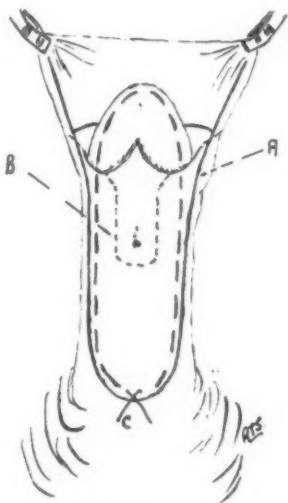
DIAGRAM. 1.

DIAGRAM 2.

small piece of rubber tubing, leaving a sac to form a continuation of the urethra opening at the glans.

Diagram 2 shows the prepuce extended out by forceps; the cross-cut at *A* is prolonged around the dorsum of the base of the glans and up to each

G

lateral angle of the hooded prepuce, and the whole inner layer of the prepuce is dissected up.   A triradiate incision is next made through the skin of the prepuce, through which the gland is pushed and the flap thus drawn over is sutured over the rawed surface of the body of the penis made by the dissection upwards of the upturned sac (see Diagram 3).
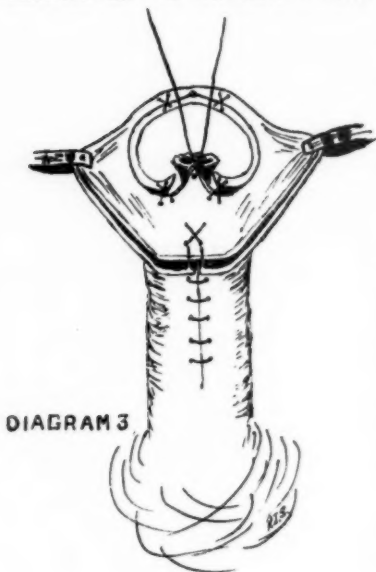
This operation has the advantage that the prepuce can be used as a skin flap to cover over all the raw surface, that the wound does not become soiled by urine, and that it will heal by first intention, and in that alone it has a great advantage over all other methods of plastic repair of a hypospadias.

In a scrotal hypospadias the same method can be adopted in two stages: first, by bringing it up to make it a penile hypospadias, and in this case enough skin can be found laterally to cover over the rawed area; and then at the second stage a penile hypospadias is operated on as described above, the prepuce being used as a skin graft.

In most cases it is necessary, as Ombredanne points out, to do a preliminary plastic operation to remedy the downward incurvation.

DIAGRAM 3

A MUSCLE EXERCISER FOR ROUND SHOULDERS.

By R. B. WADE,
Sydney.

IN the accompanying sketch an endeavour is made to show an appliance seen at the Clinic of Murk Jansen, of Leiden, for the treatment of round shoulders, early scoliosis *et cetera*. All braces, shoulder straps *et cetera*, are based on the principle of holding the shoulders back to the desired position, and in consequence muscular support in holding the spine erect and the shoulders back is rendered unnecessary, and the dorsal muscles must atrophy during the time the brace is worn.

This apparatus, on the contrary, keeps the muscles constantly in activity and teaches them to hold the back in the required position entirely by their own efforts and constant use.

The appliance consists of a pelvic band (*A*) buckling in front (*C*) and rests on the iliac crests. The back portion extends well down on to the sacrum, and at the junction of it and the pelvic band is a joint (*B*) allowing free lateral movement of the upright (*D*) on the pelvic band. The upright (*D*) is shaped to the curve, but is of a lesser amplitude and as the curves improve it is altered from time to time until full correction is allowed for. It extends from the sacrum to the seventh cervical vertebra. At the upper end of this is a loop (*E*) with a strap and buckle, composed of whip-cord covered with chamois that fits loosely enough to allow no pressure on the neck, if the body is held up to the upright. At *F* is a small pad at the point of greatest kyphotic convexity.

When the instrument is applied, the child is taught to hold himself with the neck loop loose and the back just free of the pad. If the child drops into bad position, the neck becomes uncomfortably constricted by falling forwards into the loop, and the reminder is sufficient to make him at once assume the erect position.

The drawback to the appliance is that when at school at a low desk, the patient cannot bend to write, but this can be obviated by a specially arranged higher desk.
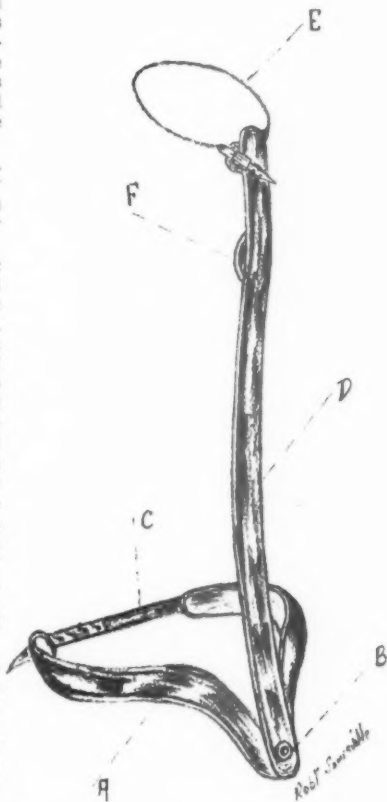
REDUCTION OF THE DEPRESSED FRACTURE OF THE MALAR BONE.

By Fay Maclure,
Melbourne.

THE technique herein described for elevation of the depressed fracture of the malar bone is simple, rapid and very easy of performance.

The instruments required are a tenotome for making two punctures in the skin at the appropriate points and two bone hooks modified for the purpose. In the ordinary bone hooks the hook portion forms a semicircle on the end of the shaft, and it is impossible by reason of this curve to make the point of the hook enter, pass through the tissues and engage on the under surface of the malar bone; the instrument maker is therefore required to alter it so that the last 2·5 centimetres (inch) of the hook is straightened and set on the shaft at about 85°, whilst the point is sharpened and slightly recurved towards the handle, this for the purpose of engaging on the under surface of the malar bone and preventing slipping.

The skin is punctured at two points. One is at the anterior inferior angle of the temporal fossa, that is, between the external rim of the orbit and the upper edge of the zygomatic bar. The other point of puncture is 18 millimetres (three-quarters of an inch) above the angle of the mouth.

Through these punctures the bone hooks are introduced, the upper one engaging on the under surface of the zygomatic bar and the lower one penetrating much more deeply passes under the lower edge of the malar and then turns vertically upwards to engage the under surface of the malar bone. The handles of the hooks are held one in each hand very firmly and the malar bone is rocked backwards and forwards a couple of time to disengage the incrushed fragments of the antral walls and immediately pulled outwards and upwards. Definite crepitus is felt, and the finger nail run along the lower edge of the orbital margin demonstrates that the step-down displacement of the ridge at the infraorbital notch has disappeared and that the deformity has been reduced.

The operation takes in all but a few moments. The skin punctures are pinched together between thumb and finger and a collodion dressing is applied to them. Care is taken during the period of recovery from the anæsthetic that the patient's arms and hands are controlled so that he does not injure his face and reproduce the deformity.

In a few days there is practically no sign from the tiny puncture wounds.
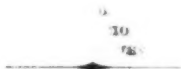
Case Reports.

DERMOID CYST OF THE SPINAL CANAL.

By P. L. HIPSLEY,

Honorary Surgeon, Royal Alexandra Hospital for Children, Sydney.

V.S., AGED three years, was admitted to the Royal Alexandra Hospital for Children on February 9, 1932. The mother stated that the child had had some difficulty in walking for the last four weeks, and that there was a discharging sinus in the upper part of the back. For several weeks also she had been very fretful and had been complaining of pain in the left side of the chest.

An examination revealed a small sinus in the middle line of the back at the level of the first thoracic spine. The skin was reddened over an area of about 2·5 centimetres (one inch) in diameter around the sinus from which a few fine hairs were protruding. A fine probe passed readily along the sinus for about 2·5 centimetres. The child was well nourished and walked with difficulty, dragging the left leg. Attempts to flex the spine in the dorsal region were resisted. The knee reflexes were exaggerated on both sides, but much more on the left. Babinski's sign was also more pronounced on the left side. Ankle clonus could be elicited on the left side also. The abdominal reflexes were absent. There appeared to be no loss of sensation in the skin, although this was difficult to determine. There was no incontinence of either urine or fæces.

Lumbar puncture revealed xanthochromic fluid which coagulated spontaneously at room temperature. The cells numbered 72 per cubic millimetre; lymphocytes numbered 80%, neutrophile cells 20%. The chloride content was 740 milligrammes per hundred cubic centimetres. Globulin was markedly increased; the fluid contained a large coagulum; glucose was absent and no organisms were visible.

Two cubic centimetres of lipiodol descendens were injected into the *cisterna magna*, after withdrawal of a similar amount of cerebro-spinal fluid. This was arrested at the level of the lower border of the seventh cervical vertebra.

Laminectomy was performed on March 2, 1932. The laminæ and spines of the upper three dorsal vertebræ were removed. The spine of the second dorsal vertebra was found to be bifid, and was perforated at its base. Sebaceous material was being extruded through the perforation. A cyst about 18 millimetres (three-quarters of an inch) long and 12·5 millimetres (half an inch) wide was present underneath and firmly adherent to the *dura mater*. The contents and lining of the cyst resembled the contents and lining membrane of a sebaceous cyst of the skin. The cyst and contents were carefully removed, and the wound was closed in layers.

Within a few days the child was able to move the legs freely, and the pain had disappeared from the chest. The child left the hospital in four weeks, although a further period of recumbency was advised on account of the weakness of the spinal column following on the laminectomy.

RECURRENT DISLOCATION OF THE LEFT SHOULDER.

By K. S. MACKY,

Auckland.

THE patient was a labourer, aged twenty-five years, on whom I had operated by the Clairmont method for recurrent dislocation of the left shoulder. The opera-

tion was performed four months ago, and since that time he had been at his work, but returned with the dislocation still recurring.

Recently I had read of two operations,[1] [2] in which the principle was the utilization of a tendon as a passive sling to stabilize the shoulder. In the one, a

peroneal tendon is excised and used as a loop sling between the acromion and the great tuberosity. In the other, the long tendon of the biceps is used. I decided in favour of the latter operation, for I saw no reason to destroy the function
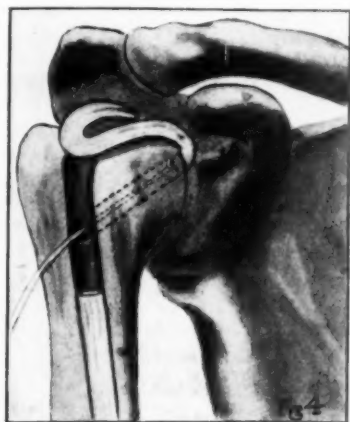
of one of the peroneal muscles when a strong tendon was to be had in the field of operation.

The man was readmitted to hospital on August 7, 1931, and operated upon on the following day. The biciptal groove was exposed, the tendon freed and divided at the

distal end of the groove. A tunnel was then made through the head of the humerus, large enough to accommodate the tendon, which was then threaded through the tunnel from within outwards. This was the difficult part of the operation, for I could not use any needle or instrument to act as a carrier of the gut. I finally thought of using a piece of kangaroo tendon, which I passed through the tunnel into the joint, where I was able to seize it and bring it up into the open; here I tied to it the chromicized gut, which was fixed to the proximal end of the tendon. To pull the tendon through the tunnel was then a simple step. The two ends of the tendon were then sutured, after all the slack had been taken in by pushing the head well into the socket. The steps of the operation are shown in the accompanying illustrations.

The after-treatment was the same as after the Clairmont operation, except that no extension of the elbow was allowed beyond the right angle for six weeks, and gentle surging faradism was used on the biceps at the end of two weeks. To date the result is quite good. The man is again in hospital with a sprained back, the result of his work. He had been labouring for two months, also swimming.

In the future I shall continue to do the Clairmont operation, for the principle is sound. I am unable to explain the failure in this case.

In regard to the mechanics of the two tendon operations, I think the use of the biceps is the more rational, for the head is not only prevented from falling out of the socket, but is held "into" the glenoid, the tendon functioning as the *ligamentum teres* in the hip joint.

References.

[1] Melvin S. Henderson: "Habitual Dislocation of the Shoulder: Results of Treatment, Especially by Tenosuspension Operation", *The Journal of the American Medical Association*, Volume XCV, November 30, 1930, page 1653.

[2] Toufick Nicola: "Recurrent Anterior Dislocation of Shoulder: New Operation", *Journal of Bone and Joint Surgery*, Volume XI, January, 1929, page 128.

RETAINED TRACHEOTOMY TUBE.

By P. L. HIPSLEY,

Sydney.

THE following case demonstrates the advantages of the use, in certain cases, of a modified tracheotomy tube.

B.K., aged four years, was admitted to the Royal Alexandra Hospital for Children when two years of age, on account of laryngeal diphtheria, and is still in hospital. She was one of those rare patients who find it impossible to carry on without the intubation tube on its being removed a few days after its insertion. After repeated attempts to discard the intubation tube had failed, it was decided to perform a tracheotomy, and after a period of about six months it was found that the respiratory tract in the region of the cricoid and upper portion of

the trachea had become completely stenosed.   Before it was decided that the child would have to wear a tracheotomy tube permanently, a specially designed intubation tube with a side piece which could be passed through the tracheotomy wound, was tried.   This was inserted after an operation had been performed to reopen the stenosed portion of the respiratory tract.   The special intubation tube is illustrated in Figure I.   It was hoped that by its use the child would have the advantages of mouth breathing, and if the tube became blocked at any time, it could be cleared easily by removing the small cap from the side tube.   When the main intubation tube had to be removed, this could be done easily by unscrewing the side piece, and then removing the main tube in the usual way.   The child wore this tube for several months, but it did not prove entirely satisfactory because of the difficulty of screwing in the side piece after the insertion of the main tube.

Thereupon another device which has proved more satisfactory, was tried.   This apparatus, which is illustrated in Figure II, consists of a small intubation tube B, which is inserted through the tracheotomy wound by means of the small handle D. The upper end of this tube reaches to a point just below the level of the vocal cords, and so would not prevent the child from talking.   The other portion of the apparatus consists of an ordinary double

FIGURE I.   A is an intubation tube about an inch longer than the usual length.   B is a hollow tube which can be screwed into the side of the intubation tube through the tracheotomy wound.   C is a small cap which can be easily removed in case of emergency.
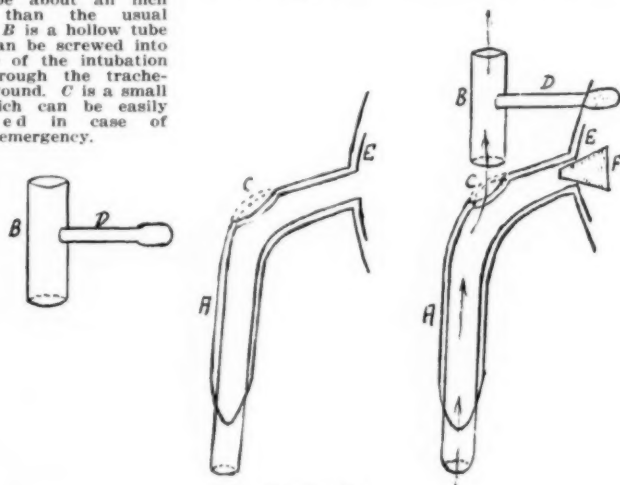
FIGURE II.[1]

tracheotomy tube, the outer part of which is perforated at the point C.   This aperture is made in such a position that when both the small intubation tube and the double tracheotomy tube have been inserted, the lower end of the former

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[1] The handle D should be nearer the lower end of tube B than shown in the diagram.

will come directly over the opening in the latter. The aperture in the inner tracheotomy tube, E, is temporarily closed by a small plug P. In case of emergency the plug P, or, if necessary, both tracheotomy tubes can be removed in the ordinary way.

The advantages of this apparatus over the use of a permanent tracheotomy tube are obvious:

1. Mouth breathing is retained.

2. The child should be able to talk as the vocal cords have free play.

3. Hospital treatment should not be necessary, as the relatives could change the tubes when necessary.

4. The larynx will not become stenosed, and there is always the possibility of being able to do something in the future so as to do away with the tubes altogether.

Surgery in Other Countries.

[In this column will be published short résumés of articles likely to be of practical value from Journals published in other countries and not readily accessible to surgeons in Australia and New Zealand.]

URINARY INCONTINENCE IN WOMEN.

I. AMREICH, of Vienna, in *Der Chirurg* of March, 1932, deals with the subject of urinary incontinence in women. The paper is divided into two parts.

Part I deals with the anatomy and physiology of the sphincter mechanism of the bladder. After preliminary discussion of the minor points which are auxiliary in maintaining continence, the author passes on to describe in detail the major and more active factors. The first of these is the loop-like internal sphincter, which is really a continuation of the lower border of the trigonalis muscle. It is composed of smooth muscle, is about one centimetre wide, and has a true loop or sling formation; its efficiency depends on the distance between the points of origin and insertion of its fibres being maintained at the optimum length for tonus.

Next in order are the group of striated sphincters, which demand a detailed examination. They are under voluntary control. They are derivatives of the original cloacal sphincter, which in women is divided into two main parts, the anal and the urogenital sphincters. The urogenital sphincter is represented in adult life by the bulbo-cavernosus muscles, the urethro-vaginal sphincter, and the external *sphincter urethræ*, their action being supplemented by the *transversus perinei profundus*, a new muscular development of the cloacal sphincter which has acquired a bony pelvic insertion.

The bulbo-cavernosus, the most caudally placed of the sphincter muscles, is split in women into two distinct muscles, taking origin on each side from the *sphincter ani* and the central body of the perineum, and running forward on either side of the vagina to end partly in the *tunica albuginea* of the clitoris, and partly in the under and inner aspect of the clitoral fascia. The major part of this muscle is associated with the female genital apparatus to which it is accessory, but it does also act as a compressor of the lower urethra.

Next in order above this is the sphincter of the membranous urethra, which in adults encloses the two orifices of the vagina and urethra as the urethro-vaginal sphincter (see Figure 1). It lies immediately against the urethra and vagina, and anteriorly and posteriorly its fibres end in a median raphé. Together with its offshoot, the deep *transversus perinei muscle*, and the fascial layers covering the upper and lower surfaces of both muscles, it forms the urogenital diaphragm. Its function is mainly static. With the *levator ani*, it has to bear the weight of the abdominal contents when their normal condition of suspension is lost. The urogenital diaphragm and the *levator ani* are inserted narrowly under one another into the pubic arch, and are mutually supporting. By its contraction the urethro-vaginal sphincter closes the vagina, and so impedes further descent of the vagina, if the *levator ani* is torn. In addition its fibres, together with those of the deep *transversus perinei*, *levator ani*, and the external urethral sphincter mat together into an interlocked mass between the vulva and the anus. All the elements of the pelvic floor are thus interlocked at this point, and act synergically. The diaphragm has a second static function, in forming a point of fixation for the urethra and vagina, the muscles forming the elastic, and the fascia the rigid, portions of the fixation. The sphincteric action of the diaphragm

can be exerted when the anterior and posterior raphés are tautened by muscular action, and its effect is to close the urethra into a sagittal cleft. It is not of first importance as a pure sphincter.

Above the diaphragm, the external sphincter of the bladder continues the striated muscle mechanism of the diaphragm upwards to the bladder, its highest transverse bundles being found in front of the smooth muscle loop of the internal sphincter. Its insertions and its sphincteric actions are entirely parallel to those of the urethro-vaginal diaphragm, but refer to urethra alone. All these three striated sphincters are really continued one into the other, and their muscle fibres are actually continuous.

An entirely different but important mechanism in the maintenance of continence is the tangential opening of the urethra from the bladder. The full bladder acts as a pressure pad on the opening, this action being eased off in
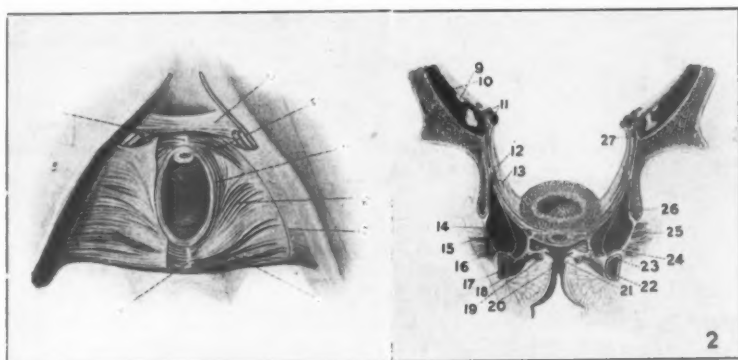

FIGURE 1. Urogenital diagram of a *nullipara*. 1 = Anterior raphé. 2 = Transverse pelvic ligament. 3 = Anterior curved fibres. 4 = Urethro-vaginal muscle. 5 = Posterior curved fibres. 6 = Cut edge of the inferior fascia of urogenital triangle. 7 = *Musculus transversus perinei profundus.* 8 = Posterior raphé.
FIGURE 2. Frontal section of a female pelvis. 9 = Ilio-psoas muscle. 10 = Femoral nerve. 11 = External iliac vein. 12 = Obturator nerve and vein. 13 = Lateral umbilical ligament. 14 = *Fascia endopelvina.* 15 = Obturator muscle. 16 = Levator muscle. 17 = *Trigonum urogenitale.* 18 = Ischio-cavernosus muscle. 19 = Urethral bulb and bulbo-cavernosus muscle. 20 = Urethra. 21 = *Labium minus.* 22 = Hymen. 23 = Anterior vaginal wall. 24 = Urethra. 25 = Venous plexus, on the ridge of the urethra and vagina.

micturition by the detrusor muscles of the anterior bladder wall, and by the pubo-vesical muscles which pull the neck of the bladder forward and upward and lessen the angle between the bladder and the urethra.

The points of fixation of the bladder and urethra are of great importance. The lower and most important is that provided by the urogenital diaphragm— the *pars fixa* of the urethra (see Figure 1). In the upper point of fixation the bladder is fixed by its own fascial attachments to the pelvis, but its main fixation is to the angle of the genital canal. It is bound to this by strong fascial sheets, and the angle in its turn is held strongly fixed by similar stout sheets of fascia. Owing to this close connexion, both organs must be equally affected by physical conditions or changes of position acting on either of them. Should the upper and the lower fixed points of the urethra approximate each other, there occurs a slackening of the loop of the internal sphincter, and a loss of its efficiency in maintaining firm closure of the bladder. Of these various mechanisms, the smooth-muscle internal sphincter is the most important in maintaining con-

tinence, with its power of tonic contraction. An illustration of this is the fact that it holds the bladder closed in deep anæsthesia, when voluntary control has long been abolished. The striated sphincters act as a voluntary reinforcement to it in emergency, and can even to some extent act as substitute for it in partial loss of its efficiency.

The muscular mechanism engaged in maintaining continence consists thus of two synergic groups. These are of differing origin (one smooth, and one striated muscle), and have therefore different physiological properties (one tonic, the other swift contraction); they have different pressure effects on the urethra (transverse and sagittal slits), and they possess differing innervations (pelvic plexus, and pudendal nerve). By this means the security of the bladder closure is assured to the highest possible degree.

In Part II of his paper, Dr. Amreich proceeds to point out the anatomical damage which is the most usual result of birth traumata. Briefly, it consists of tearing and fibrosis of the *levator ani* and loosening and sagging of the urogenital diaphragm, and, as a result of this, approximation of the fixation points of the sphincter system and loss of efficiency of the sphincters. He urges greater prophylactic care in regard to the use of forceps, and timely performance of episiotomy to protect the perineum.

FIGURE 3. Preparation to demonstrate Franzsch's operation. 28 = Muscle bridle prepared from the right limb of the levator muscle. 29 = Free edge of the left levator muscle.

As regards operative treatment, he advises three types of operation. In moderate grades of incontinence with genital prolapse, the Schauta-Wertheim interposition operation is suitable. It raises the bladder floor, and thus brings back the two fixation points to their normal distance, with consequent tautening of the internal sphincter. Also there results from it some elastic pressure on the bladder floor from the "spring back" tendency of the sharply bent body of the uterus.

In cases of mild or moderate severity, without much prolapse, and with a reasonable chance of some useful sphincter muscle being present, direct reconstruction of the sphincters is the operation of choice. This is done by picking up the paraurethral tissue close to the neck of the bladder in fine sutures, and bringing them t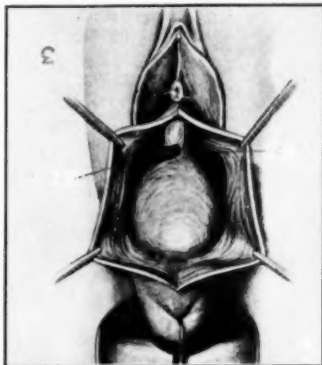ogether across the lower surface of the urethra in two parallel folds. This unites the torn ends of the external sphincter. By including in the most proximal of the sutures a small portion of the lateral urethral wall, even the loop of the internal sphincter may be shortened, while by carrying the sutures distally the fibres of the urethro-vaginal sphincter are reunited similarly to those of the external sphincter. Amreich concludes this operation by "doublebreasting" the vaginal fascia, dissecting up right and left flaps of the fascia through a median vaginal incision. The right flap is laid over the plicated bladder floor, and is fixed with its free border in the angle between the bladder and the left flap, the latter being then similarly sutured across to the angle on the opposite side.

In the most severe cases of incontinence, with constant dribbling, with complete loss of the muscular sphincters, but with a bladder floor in approximately its normal position, a "substitution plastic" operation is used. In this operation the ineffective sphincters are replaced by loops of muscle cut from the anterior limb of the *levator ani* on either side, leaving intact their attachments to the symphysis, and brought round under the neck of the bladder (see Figure III).

In doing this the trigone and the bladder neck are freed from the vagina, and by getting into the correct plane in the vesico-vaginal space it is easy to go out laterally and find the anterior limb of the *levator ani*, to which indeed the lateral walls of the vagina are attached (see Figure II). The end result is not an actively contractile loop, but a rigid fibrous sling which supports and tautens the internal sphincter and somewhat kinks the bladder neck.

Whatever operation is done for incontinence, Amreich is so impressed with the value of direct reconstruction, that he considers it should be undertaken as a routine step supplementary to all incontinence operations.

A. BROWN.

MODIFICATION OF OUDARD'S OPERATION FOR THE TREATMENT OF RECURRENT DISLOCATION OF THE SHOULDER.

M. M. J. C. BLOCH AND O. GUIHENEUC, writing in *Journal de Chirurgie*, September, 1931, describe a modification of Oudard's operation for the treatment of recurrent dislocation of the shoulder.

The operation is designed to produce a pre-articular bony block by elongation of the coracoid process. It is stated that this procedure alone, without capsulorrhaphy, is permanently effective.

The technique is as follows: The patient lies on his back, with the arm abducted to about 90° on an armrest. The shoulder joint may be elevated by a pillow placed beneath the scapula.

The incision follows the delto-pectoral groove, beginning three centimetres above the humeral insertion of the deltoid and ending at the clavicle. The cephalic vein is divided between ligatures near its termination. The deltoid and pectoral margins are separated by clean dissection throughout the full length of the exposure and then retracted in the upper angle of the incision.

The coracoid process is now exposed to view and its horizontal portion, tip and muscular attachments are clearly defined by further dissection. A wide curved rougine is introduced beneath the horizontal position to protect the vascular-nervous bundle.
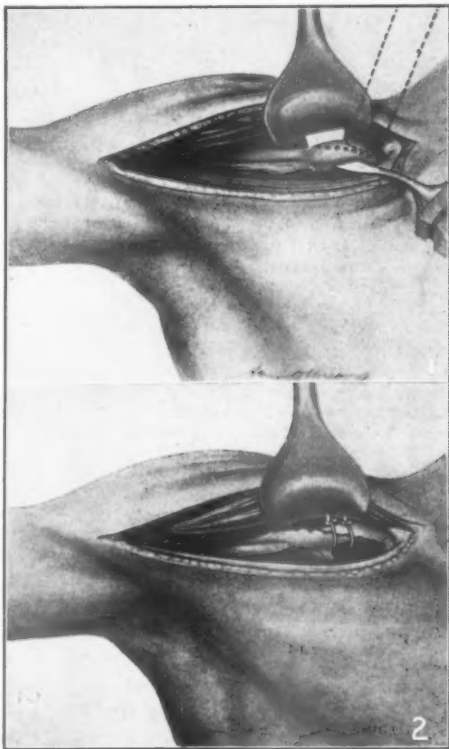

FIGURE 1. Perforation and section of coracoid process.
FIGURE 2. Operation completed.

The elongation of the coracoid by a sliding graft technique is the next step. The periosteum is incised on the upper surface of the coracoid in an oblique line. This incision is sufficiently widened with a rougine to permit the drilling of four holes through its median plane from the upper to the lower surface. These holes are so placed that they may be easily joined up with a flat chisel, so detaching a fragment of coracoid about four centimetres long, including the tip and the inner aspect with their muscular insertions intact. It is now a simple matter to slide this fragment outwards on the fixed portion, elongating the coracoid process by about three centimetres and allowing an overlap of about one centimetre. This position is maintained by ligatures of silk or wire. The four essential steps of the second stage of the operation—defining, dividing, sliding and fixing of the coracoid graft—are now complete.

The muscle edges are drawn together with a few catgut sutures, and the skin is sutured. A filiform drain is left in the lower angle for forty-eight hours.

The shoulder, arm and forearm are immobilized in a simple sling for two or three weeks. The arm is then freed, but all forced or violent efforts are forbidden during the next two to three months while the graft is establishing firm union.

The authors present reports of cases to establish the effectiveness of their operation. They also report many successful results of the original Oudard operation where a tibial graft was used to elongate the coracoid process. Oudard combined with this operation a capsulorrhaphy and a section of the tendon of the subscapularis muscle. These steps were later found unnecessary.

Recurrent dislocation of the shoulder is a disabling and painful condition. The many operative procedures in use, ranging from simple capsulorrhaphy and tenotomy, to muscular and fascial suspensions, even to excision of the humeral head or arthrodesis of the shoulder joint, are evidence that treatment may often be difficult and ineffective.

Further case reports will test the effectiveness of the simple procedure of the elongation of the coracoid.

F. F. D'ARCY.

ARTHROPLASTIC RESECTION OF THE HIP JOINT.

PAUL MATHIEU, in *Journal de Chirurgie*, July, 1931, writes on arthroplastic resection of the hip joint. Operation is guided by the following principles:

1. The head is resected and the great trochanter detached. This allows the stump of the neck to be introduced easily into the acetabulum.

2. The trochanter is implanted on the femoral shaft lower down, so as to avoid slackness of the gluteal muscles.

Lexer is credited with the origination of this procedure.

The steps in the operation may be summarized as follows:

1. Exposure through an anterior incision with inferior extension (see Figure 1).

2. Separation of the great trochanter with muscles intact (see Figure 2).

3. Arthrotomy and resection of the head (see Figure 3).

4. Shaping of the stump of the neck of the femur (see Figure 4).

5. Introduction of the remodelled stump into the acetabulum. If the acetabulum is well lined with cartilage, no fascial flap is used; if the acetabulum is not in good condition, a free fascial flap cut from the *fascia lata* of the other thigh is introduced (see Figure 4).

6. Implantation of the trochanter on a newly freshened surface as low on the shaft as possible. A screw is used to fix the trochanter in its new position.

7. Closure of the wound.

After closure of the wound, the limb is fixed in a plaster extending from the pelvis to the foot, and the plaster is left on for ten days. After this, the limb is suspended and movements are commenced. In about six weeks the patient gets up on crutches.

The operation is useful in many cases, and is varied somewhat with circumstances. Its great field lies in the treatment of *arthritis deformans*, ununited fracture of the neck with false joint formation, old unreduced dislocations, and the sequelæ of acute inflammation.
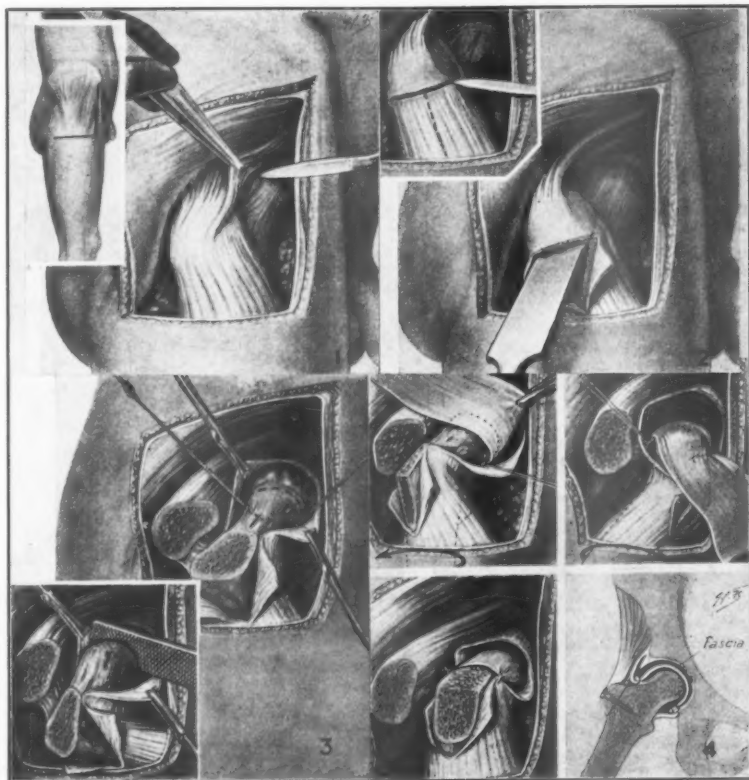
FIGURE 1. Arthroplastic resection of the hip. Anterior incision continued transversely below exposure of the capsule.

FIGURE 2. Section of the great trochanter.

FIGURE 3. Section of the neck.

FIGURE 4. Top left and top right: Replacing the fixation of the stump of the neck with a strip of free *fascia lata*. Below left and below right: Reintroduction into the acetabulum of the neck covered with aponeurosis. Scheme of the final result.

Results.—A small amount of movement is usually retained, which is of great use to the patient. Pain is usually absent. The joint is stable. The author states that the gravity of operations on the hip has been exaggerated, and that, with proper care, accidents are few. Records of cases are appended.

HUGH TRUMBLE.

CONTROL OF THE ARTIFICIAL ANUS.

IN *Der Chirurg*, December, 1932, F. Hesse, of the Surgical University Clinic of Leipzig (Director, Professor E. Payr), writes about the value of Haecker-Kurtzahn's method of control of the artificial anus.

A   B

FIGURE I.

The technique of this operation is as follows:

1. On the abdominal wall, in the position shown in Figure I (A), a flap of skin five centimetres broad and 6 centimetres long is turned up. Out of this flap is formed a skin tube, as shown in Figure I (B).
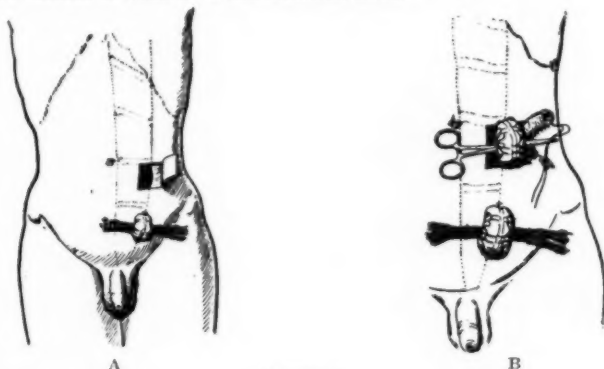

FIGURE II. 1 = Control plastic with a rubber tube through the lumen of the cube of skin. 2 = Artificial anus.

2. An opening is made in the rectus sheath, the rectus muscle is displaced medianwards, the abdominal cavity is opened, and, according to circumstances, either the upper part of the sigmoid colon, the mobilized descending colon or the transverse colon is drawn through this opening. A hole is now made in the mesocolon, and through this the skin tube is drawn and stitched to the median skin edge.

3. The edges of skin are now mobilized and sutured to each other, so that they are united over the displaced segment of colon. The skin tube is open at both ends. The displaced piece of large bowel lies between the skin tube and the skin covering.

4. A rubber tube is inserted into the lumen of the skin tube, and is used for the control of the bowel (see Figure II).

5. The artificial anus is formed in the usual way a little further down the sigmoid colon (see Figure II).

This operation has been successfully used to control an artificial anus which has been made for innocent affections, and from which, therefore, the patient may have suffered for many years.

H. B. DEVINE.

Reviews.

SURGERY OF THE RECTUM.

"The Principles and Practice of Rectal Surgery",[1] a book of 256 pages, by W. B. Gabriel, is a record of the author's experience as one of the surgical staff on Saint Mark's Hospital, where he has been for the last thirteen years. The work is concerned chiefly with the practical side of rectal surgery: diagnosis, treatment, and the attention to small details, upon which success in this branch of surgery so much depends. The last two chapters (about one hundred pages), deal with benign tumours and cancer of the rectum.

The author writes fully on the injection treatment of hæmorrhoids. He gives in detail the technique of his own methods and those in routine use at Saint Mark's Hospital; he uses a solution of phenol in vegetable oil. There are many practical points in this chapter which the reader will find useful. Anal fissure is healed by injecting a solution of "Percaine" in oil into the surrounding tissues.

The chapter on *pruritus ani* is illuminating. The author's experience is that in 90% of cases this affection, which is so intractable to the usual methods of treatment, can be cured. He depends mainly on perianal subcutaneous injections of "Percaine" in oil. The general practitioner will find the author's methods of treatment easily applicable in practice.

In dealing with cancer of the rectum, the author sets great value on the researches of Dr. Cuthbert Dukes; particularly in regard to the grouping of cancers according to their proved method of spread. In the operative treatment the author breaks no new ground; and in his opinion, Lockhart-Mummery's operation is the one which is most dependable. He makes a special point of the value in surgery of the rectum of what he calls "low spinal anæsthesia". "This", he writes, "has such overwhelming advantages that the method is used to the exclusion of all others." He injects between the fourth and fifth vertebræ five cubic centimetres of a solution of "Stovaine". This produces an area of anæsthesia in the perineum, corresponding to the distribution of the third, fourth and fifth sacral nerves. There is no fall of blood pressure.

This book is valuable because it reflects the practice at a hospital world famous for the treatment of rectal diseases. The book has a great many illustrations, most of which are original and many of which are in colour. It will be found a very useful book for all branches of the medical profession.

A SURVEY OF SURGERY.

Volume II of "A Shorter Practice of Surgery", by Hamilton Bailey and McNeill Love, includes a consideration of the affections of the abdomen, thorax, nervous system and skin, and also of specific diseases and tumours.[2] With Volume

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[1] "The Principles and Practice of Rectal Surgery", by W. B. Gabriel, M.S., F.R.C.S.; 1932. London: H. K. Lewis and Company, Limited. Royal 8vo., pp. 256, with 118 illustrations, including eight coloured plates.

[2] "A Short Practice of Surgery", by Hamilton Bailey, F.R.C.S., and R. J. McNeill Love, M.S., F.R.C.S.; Volume II; 1932 London: H. K. Lewis and Company, Limited. Demy 8vo., pp. 475, with 352 illustrations. Price: 20s. net.

I, which has already been published, it completes a survey of general surgery which has been designed along original and useful lines.

The authors evidently believe in using pictorial methods of teaching, instead of verbose descriptions, for the volume is full of small illustrations, often roughly drawn by the authors themselves, which make the text very easy to follow. Classifications, tabulations and what are apparently blackboard diagrams used in teaching, are used freely throughout the book. These give the text a simplicity and a directness, which, we feel sure, will enable the student to get a proper perspective, not only in his reading, but also in his ward work.

The book contains much new matter. This has, however, been carefully selected so as to include only methods the application of which has proved satisfactory in practice. On the other hand, a great deal that is included for the sake of completeness, in the average textbook, has to be omitted from a small work such as this. For example, the chapter on the stomach and duodenum is very short, and includes only the bare outlines of the surgery of these regions. In contrast to this, such subjects as acute obstruction of the small intestine, appendicitis, affections of the rectum and anal canal—subjects of importance to the general practitioner and to the student—are treated very fully, and special emphasis is placed on those constantly recurring fatal errors which are brought into prominence by hospital practice. The following example of this is found in the chapter on intestinal obstruction:

> Any writer on this subject shoulders a great responsibility. The mortality of acute intestinal obstruction, excluding strangulated hernia and idiopathic intussusception, has stood at about 40 per cent. for many years. Undoubtedly the reason for the high figure is that diagnosis is delayed unduly because, it is said, textbooks portray the picture of obstruction when the patient is already at death's door. It is difficult to do justice to a subject like intestinal obstruction in a small space.

In the introduction to the chapter on "Acute Appendicitis", the authors write:

> Nearly three thousand persons die annually from appendicitis in the British Isles alone. Many of them are in youth or the prime of life. Practically all these lives could be saved if an early diagnosis and, at this stage, the comparatively simple operation of appendicectomy was performed. The importance of this subject cannot be overstated.

This problem of acute appendicitis is dealt with from a practical standpoint; for instance, it is considered under such heads as the abuse of purgatives, acute appendicular obstruction, atypical acute appendicitis, erroneous diagnosis of appendicitis, the Ochsner-Sherren (delayed) treatment of late acute appendicitis, and the selection of cases for the "delayed treatment".

Many water-colour drawings and coloured diagrams are effectively used. This book, we feel sure, will attract students, because it is written by men who have had a large experience in teaching, and because it deals with surgery from the point of view of present-day hospital practice.

OTOLOGY.

IN spite of an abundance of text books, there seems always to be room for another; and "The Principles and Practice of Otology", by Watkyn-Thomas and Yates, a volume of five hundred pages, must be given a place for its sheer excellence.[1]

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[1] "The Principles and Practice of Otology", by F. W. Watkyn-Thomas, F.R.C.S., B.Ch., and A. L. Yates, M.C., M.D., F.R.C.S.; 1932. London: H. K. Lewis and Company, Limited. Demy 8vo., pp. 580, with 199 illustrations. Price: 25s. net.

The preliminary description of physiology and anatomy is clear and concise. Next follows a very full consideration of deafness, this subject at last appearing in a text book in modern conception based upon the correlation of audiometry and precise clinical findings. Treatment is then given rational consideration in terms of the preliminary investigation. If, for no other reason, this book must receive high praise for the part it must surely play in furthering the scientific consideration of loss of hearing. Description of surgical conditions follows, and here again each step is described, with the reason for its performance and with appropriate mention of dangers and errors. Diagnosis and the treatment of intracranial complications are considered in a full but simple manner, controversial matter being avoided, yet without undue dogmatism; so that the reader must close the book with a confidence-giving broad understanding of the subject, yet fully aware that there is yet much to be understood.

A useful thesis on the subject of vertigo occupies one of the concluding chapters, and contains the accepted as well as the last-minute conclusions about this condition.

Throughout the book is abundantly supplied with illustrations and diagrams; the text is clear and well arranged, while there is an excellent bibliography and index.

Question must arise on the preface statement that the work is intended for student otologists, and also for the general practitioner surgeon. One needs to be interested almost to the extent of specialization to grasp fully and to employ many of the detailed methods described, or to contemplate labyrinthotomy and intracranial surgery such as are given description. Many a practising otologist fails to consider deafness in the manner set out, for the reason that he has not had the problem set before him in a composite thesis on the modern methods; to such this work must prove most useful. The general practitioner who reads and masters the description of deaf-relief and the surgical methods described, and who is able to combine them with experience, must also become similarly informed in respect of the nose and throat, and will then truly be able to regard himself as no longer merely a general practitioner, but a specialist in oto-rhino-laryngology. It is doubtful whether it is possible to master this detail and to keep abreast of advances in obstetrics, in general medicine, and surgery. The conclusion is that this work, in the fullness of its description, is one for the specialist or intending otologist.

Post=Graduate Study.

THE aim of the Post-Graduate Bureau, which has been established by the Council of the Royal Australasian College of Surgeons, is to provide a centre where graduates desirous of learning details regarding courses of instruction available in Australasia or overseas, may apply with the certainty of gaining adequate information.

Already a good deal of material regarding the English and Continental clinics is available at the Bureau. Inquiries will always be welcomed from graduates proposing to travel overseas regarding such matters as types of work available in various centres, places of residence and approximate fees for courses.

In due course, under this heading, will be published details of English and Continental surgical clinics. The present series deals with the post-graduate work available in Melbourne.

Melbourne Hospital.

The Melbourne Hospital is situated at the corner of Swanston Street and Lonsdale Street, covering an entire city block. Associated with the hospital is the Walter and Eliza Hall Institute of Research in Pathology and Medicine.

The hospital contains 199 surgical beds, which are in constant use. During the year ending June 30, 1932, 5,141 patients were admitted to the wards for surgical conditions, and 13,787 new patients received treatment for surgical conditions in the out-patient department.

In addition to general surgery, there are special departments for the treatment of diseases of the ear, nose and throat, eye and teeth and, in addition, are departments devoted to gynæcology, orthopædics, pædiatrics, urology and venereal diseases.

The organization of the hospital provides ample facilities for post-graduate clinical instruction in surgery, special courses being arranged from time to time. Opportunities for research are provided under the supervision of the staff.

Staff.

The general surgical staff of the hospital consists of six in-patient surgeons, with six corresponding out-patient surgeons, organized into surgical units.

Appointments as surgical assistants to indoor surgeons are available to graduates desirous of increasing their knowledge of the science and art of surgery. These appointments are for one year.

Each special department is under the charge of one specialist, who has a number of clinical assistants. The specialists control both the indoor and outdoor departments in their specialties.

Visiting practitioners are always welcomed by the staff, who are glad to afford facilities for observing the work of the hospital.

Further information may be obtained from the Dean of the Medical School, Mr. Victor Hurley, Melbourne Hospital, C.1.

The members of the surgical staff at present are:

Indoor Surgeons.	*Visits.*	*Operates.*
Mr. Basil Kilvington ...	Tuesday, p.m.	Monday, a.m.; Thursday, p.m.
Mr. B. T. Zwar	Monday, p.m.	Tuesday, a.m.; Thursday, p.m.
Mr. Alan Newton	Friday, p.m.	Monday, p.m.; Wednesday, a.m.
Mr. Victor Hurley	Thursday, p.m.	Monday, a.m.; Friday, a.m.
Mr. T. E. L. Lambert ..	Monday, p.m.	Tuesday, p.m.; Thursday, a.m.
Mr. W. G. D. Upjohn	Thursday, p.m.	Tuesday, p.m.; Friday, a.m.

Outdoor Surgeons.	*Out-Patient Clinic.*	*Operates.*
Mr. W. A. Hughes-Jones..	Tuesday, 1.30 p.m. Friday, 1.30 p.m.	Monday, p.m.
Mr. W. A. Hailes	Monday, 1.30 p.m. Thursday, 1.30 p.m.	Wednesday, p.m.
Mr. Henry Searby	Tuesday, 1.30 p.m. Friday, 1.30 p.m.	Thursday, a.m.
Mr. Julian Smith, Jnr. ..	Monday, 1.30 p.m. Thursday, 1.30 p.m.	Tuesday, a.m.
Mr. A. E. Coates	Monday, 1.30 p.m. Thursday, 1.30 p.m.	Wednesday, a.m.
Mr. E. S. J. King	Tuesday, 1.30 p.m. Friday, 1.30 p.m.	Wednesday, p.m.

Orthopædist.	*Visits.*	*Operates.*
Mr. C. W. B. Littlejohn ..	Monday and Thursday, 9 a.m.	Friday, p.m.
Gynæcologist.		
Dr. R. W. Chambers	Monday and Thursday, 9 a.m.	Wednesday, a.m.
Urologist.		
Dr. J. T. Tait	Tuesday and Friday, 2 p.m.	Wednesday, p.m., and Tuesday, a.m.

Saint Vincent's Hospital.

Saint Vincent's Hospital is situated on Eastern Hill in Victoria Street, and is readily accessible from the city. Building operations are at present in progress and will greatly increase the capacity of the wards. The complement of surgical beds in the hospital will then be 100. During the year ended June 30, 1932, 1,770 in-patients received surgical care, while during the same period there were 8,144 new cases in the out-patient department.

Special departments in the surgical service include those for eye, ear, nose and throat conditions and gynæcology. With the completion of the new building, further special departments may be organized.

Staff.

The surgical staff of the hospital consists of four in-patient surgeons and five out-patient surgeons. The special departments are provided with an in-patient surgeon and two out-patient surgeons in each specialty. Members of the staff are always pleased to welcome visitors.

The members of the surgical staff at present are:

In-Patient Surgeons.	*Visits.*	*Operates.*
Mr. H. B. Devine	Monday, a.m. Friday, p.m.	Tuesday, a.m. Friday, p.m.
Mr. Forbes MacKenzie ..	Tuesday, a.m. Friday, a.m.	Wednesday, p.m. Friday, a.m.
Mr. Gordon Shaw	Thursday, a.m. Tuesday, p.m.	Friday, a.m. Tuesday, p.m.
Mr. Leo Doyle	Monday, a.m. Wednesday, a.m.	Monday, a.m. Thursday, a.m.

Out-Patient Surgeons.	*Out-Patient Clinic.*	*Operates.*
Mr. J. Newman Morris ..	Wednesday, a.m. Saturday, a.m.	Friday, p.m.
Mr. J. G. Whitaker	Tuesday, p.m. Friday, a.m.	Monday, p.m.
Mr. F. Colohan	Monday, p.m. Thursday, a.m.	Friday, a.m.
Mr. Charles Osborn	Tuesday, a.m. Friday, p.m.	Thursday, a.m.
Mr. F. F. D'Arcy	Monday, a.m. Thursday, p.m.	Tuesday, p.m.

Gynæcologists.		
In-Patient—		
Mr. R. F. O'Sullivan ..	——	Monday, a.m. Thursday, a.m.
Out-patient—		
Mr. Hubert Jacobs ...	Monday, p.m.	——
Mr. Eccles Mackay ...	Wednesday, p.m.	——

Alfred Hospital.

The Alfred Hospital, which serves many of the southern suburbs, is located in Commercial Road, Prahran, S.1. There are extensive grounds, with opportunities for further extension. A new community block, in association with the hospital, has been recently erected. During the year ended June 30, 1932, 4,320 in-patients were treated in the surgical wards. During the same period 33,206 new surgical out-patients received attention. In addition to general surgery, there are special departments for eye, ear, nose and throat conditions, gynæcology and children's diseases. A course in post-graduate clinical instruction is arranged for a fortnight each year. Associated with the hospital is the Baker Institute for Medical Research, where graduates desirous of pursuing any particular problem are always welcome.

Staff.

The surgical staff of the hospital consists of four in-patient surgeons, with their corresponding out-patient surgeons. Appointments as surgical assistants to indoor surgeons are available to graduates wishing to increase their knowledge of the science and art of surgery, these appointments being for one year, in the first instance. Further information may be obtained from the Dean of the Medical School, Mr. Hugh Trumble, Alfred Hospital. Visiting practitioners are always welcomed by the staff, who are glad to afford facilities for observing the work of the hospital. The members of the surgical staff at present are:

In-Patient Surgeons.	*Days of Attendance.*	*Operates.*
Mr. Balcombe Quick	Wednesdays and Saturdays.	Thursday mornings. Monday afternoons.
Mr. A. Fay Maclure	Mondays and Thursdays.	Tuesday afternoons. Friday mornings.
Mr. R. St. Clair Steuart..	Mondays and Thursdays.	Tuesday mornings. Friday mornings.
Mr. J. Kennedy	Tuesdays and Fridays.	Wednesday mornings. Saturday mornings.
Out-Patient Surgeons.	*Out-Patient Clinic.*	*Operates.*
Mr. A. J. Trinca	Mondays and Thursdays at 9 a.m.	Tuesday afternoons.
Mr. H. C. Trumble	Mondays and Thursdays at 9 a.m.	Friday afternoons.
Mr. C. J. Officer Brown ..	Tuesdays and Fridays at 9 a.m.	Wednesday afternoons.
Mr. E. T. Cato	Wednesdays and Saturdays at 9 a.m.	Thursday afternoons.
Gynæcologist.		
Mr. Robert Fowler	Mondays and Thursdays at 2 p.m.	Wednesday mornings. Saturday mornings.

Women's Hospital.

The Women's Hospital is situated in Swanston Street, Carlton. It occupies an entire city block, and is divided into obstetrical and gynæcological sections. During the year ended June 30, 1932, in the maternity department 4,876 patients received treatment, 2,087 obstetrical operations were performed, and 3,236 living children were born; in the gynæcological side, 1,364 operations were performed. There is a special subdivision for radium treatment, and 59 patients passed through this section in the year.

A post-graduate course is held in October or November of each year. This course extends over two weeks, and lecture demonstrations are given in both obstetrics and gynæcology. Arrangements are made for a limited number of

post-graduate students to reside in the hospital at the time of this course, but post-graduates, by special arrangement, may reside within the hospital at any time during the year.

Staff.

The gynæcological staff of the hospital consists of six in-patient and six corresponding out-patient surgeons. The maternity department has five honorary midwifery surgeons. Visiting practitioners anxious to observe the work of the hospital are always welcomed by the staff. Further information may be obtained from the Dean of the Medical School, Dr. B. Milne Sutherland, Women's Hospital, Carlton.

The members of the surgical staff at present are:

Honorary In-Patient Gynæcologists.	Days Attending Hospital.	Operation Day.
Dr. B. Milne Sutherland	Monday, Wednesday and Friday mornings.	Tuesday, 9 a.m.
Dr. Edward R. White ...	Wednesday and Saturday, 11 a.m.	Thursday, 9 a.m.
Dr. W. G. Cuscaden	Monday, Tuesday and Thursday, 2.30 p.m.	Wednesday, 9.30 a.m.
Dr. Arthur Sherwin ...	Wednesday and Saturday.	Monday, 9 a.m.
Dr. S. H. Allen	Thursday and Monday.	Friday, 9 a.m.
Dr. N. L. Speirs	Wednesday and Friday.	Saturday, 9 a.m.

Honorary Out-Patient Gynæcologists.	Days Attending Hospital.	Operation Day.
Dr. P. G. Brett	Monday, 2 p.m.	Thursday, 8.15 a.m.
Dr. R. N. Wawn	Wednesday, 2 p.m.	Friday, 8.15 a.m.
Dr. A. M. Wilson	Thursday, 2 p.m.	Tuesday, 8.15 a.m.
Dr. J. Leon Jona	Saturday, 9.30 a.m.	Wednesday, 12 noon.
Dr. A. W. Harley	Friday, 2 p.m.	Saturday, 12 noon.
Dr. G. Simpson (locum)	Tuesday, 2 p.m.	

Honorary Midwifery Surgeons.	Days Attending Hospital.
Professor R. Marshall Allan	Monday, 10 a.m.
Dr. John S. Green	Tuesday, 10 a.m.
Dr. W. I. Hayes	Friday, 10 a.m.
Dr. W. D. Saltau	Wednesday, 10 a.m.
Dr. F. E. True	Thursday, 10 a.m.

Books Received.

THE FOLLOWING BOOKS HAVE BEEN RECEIVED. A SELECTION WILL BE MADE FROM THESE FOR REVIEW IN SUBSEQUENT ISSUES.

THE TECHNIQUE OF CONTRACEPTION: AN OUTLINE, by E. M. Matsner, M.D., with Foreword by R. L. Dickinson, M.D., and Introduction by F. Kennedy, M.D.; 1933. Baltimore: Williams and Wilkins Company. Demy 8vo., pp. 38, with illustrations.

WHAT THE DIABETIC NEEDS TO KNOW ABOUT DIET FOR EASY USE IN ALL HOUSEHOLDS, by a Science Graduate and a Certified Dietitian (University of London), who have made a special study of the subject; revised by a well-known Physician—an Authority on Nutrition; 1933. London: John Bale, Sons and Danielsson, Limited. Crown 8vo., pp. 80. Price: 2s. net.

MODERN BIRTH CONTROL METHODS, OR HOW TO AVOID PREGNANCY, by G. R. Scott, F.Ph.S., F.Z.S., with Foreword by Sir W. Arbuthnot Lane; 1933. London: John Bale, Sons and Danielsson, Limited. Crown 8vo., pp. 216. Price: 7s. 6d. net.

DISEASES OF THE HEART DESCRIBED FOR PRACTITIONERS AND STUDENTS, by Sir Thomas Lewis, C.B.E., F.R.S., M.D., D.Sc., F.R.C.P.; 1933. London: Macmillan and Company, Limited. Royal 8vo., pp. 317, with illustrations. Price: 12s. 6d. net.

HOEBER'S SURGICAL MONOGRAPHS: THE DUODENUM, ITS STRUCTURE AND FUNCTION, ITS DISEASES AND THEIR MEDICAL AND SURGICAL TREATMENT, by E. L. Kellogg, M.D., F.A.C.S., with Foreword by G. D. Stewart, M.D., F.A.C.S.; 1933. New York: Paul B. Hoeber. Demy 4to., pp. 882, with illustrations. Price: $10.00 net.

ANATOMY OF THE BRAIN AND SPINAL CORD, by W. W. Looney, A.B., M.D.; Second Edition; 1932. Philadelphia: F. A. Davis Company. Royal 8vo., pp. 370, with 153 illustrations.

THE PRINCIPLES AND PRACTICE OF PSYCHIATRY, by A. Cannon, M.D., and E. D. T. Hayes, M.D.; 1932. London: William Heinemann (Medical Books) Limited. Crown 4to., pp. 454, with illustrations. Price: 25s. net.

PRACTICAL OBSTETRICS FOR STUDENTS AND PRACTITIONERS, by P. B. Bland, M.D., assisted by T. L. Montgomery, M.D.; 1932. Philadelphia: F. A. Davis Company. Super Royal 8vo., pp. 750, with 516 engravings, including 21 coloured plates.

THE FAILING HEART OF MIDDLE LIFE: THE MYOCARDOSIS SYNDROME, CORONARY THROMBOSIS AND ANGINA PECTORIS, WITH A SECTION UPON THE MEDICO-LEGAL ASPECTS OF SUDDEN DEATH FROM HEART DISEASE, by A. S. Hyman, A.B., M.D., F.A.C.P., and A. E. Parsonnet, M.D., C.M., F.A.C.P., with Preface by D. Riesman, M.D., Sc.D., F.A.C.P.; 1932. Philadelphia: F. A. Davis Company. Royal 8vo., pp. 558, with 166 illustrations, some in colour. Price: $5.00 net.

THE PRINCIPLES AND PRACTICE OF OTOLOGY, by F. W. Watkyn-Thomas, F.R.C.S., B.Ch., and A. L. Yates, M.D., F.R.C.S.; 1932. London: H. K. Lewis and Company, Limited. Demy 8vo., pp. 565, with 199 illustrations, five in colour. Price: 25s. net.